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Assessment of the functional status of patients admitted to a medical clinic ward: a cross-sectional study

Avaliação do estado funcional de pacientes admitidos em uma enfermaria de clínica médica: um estudo transversal

Evaluación del estado funcional de pacientes ingresados en una enfermería de clínica médica: un estudio transversal

Eduardo da Silva Paula[1], Darlisson Bueno Paranhos[2], Adijalme Martins Junior[3]
Fernanda Regina de Moraes[1]

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Abstract:
Objective: to characterize the functional status of patients admitted to a medical clinic ward and compare clinical variables according to functional level and verify whether a low functional level was associated with worse clinical outcomes. **Methods:** this is a cross-sectional, descriptive and quantitative study, carried out with adult patients admitted to a university hospital from May to July of 2019. Functional independence was assessed using the Barthel Index. Patients were grouped according to their Barthel Index score: severe dependence (<60 points), moderate dependence (between 60 and 80 points) and independent (>85). Variables between groups were analyzed using the Chi-square test and ANOVA. The analysis of variables associated with length of hospital stay was performed using multiple linear regression. **Results:** 97 patients were included. Of these, 52.5% were female, with a mean age of 63.3 (17.7) years and 86 (88.7%) had comorbidities. Most patients (85.6%) were referred from the UPA. Respiratory diseases were the main causes of hospitalization (33%). Only 19.1% were functionally independent. Patients with moderate to severe functional dependence had a greater need for hospital readmission (p=0.040). Length of hospital stay until referral to a hospital (p=0.011) was an independent factor associated with a longer hospital stay. **Conclusion:** it was found that patients admitted to the ward in the first 24 hours had a low functional level. Patients with functional dependence, when compared to independent patients, had a higher readmission rate.
Keywords: Functional status; Activities of daily living; Length of stay; Patient Admission; Inpatients.

Resumo:
Objetivo: caracterizar o estado funcional de pacientes admitidos em uma enfermaria de clínica médica e comparar as variáveis clínicas conforme o nível funcional e verificar se um baixo nível funcional estava associado a piores desfechos clínicos. **Método:** estudo transversal, descritivo e quantitativo, realizado com pacientes adultos internados em um hospital universitário entre de maio a julho de 2019. A avaliação da independência funcional foi realizada pelo Índice de Barthel. Os pacientes foram agrupados de acordo com a pontuação no Índice de Barthel, dependência severa (<60 pontos), dependência moderada (60 e 80 pontos) e independente (>85). As variáveis entre os grupos foram analisadas pelo teste de Qui-quadrado e Anova. A análise das variáveis associadas ao tempo de internação hospitalar foi realizada através da regressão linear múltipla. **Resultados:** foram incluídos 97 pacientes, 52,5% do sexo feminino, idade média de 63,3(17,7) anos e 86 (88,7%) apresentavam comorbidades. A maioria dos pacientes (85,6%) encaminhados da UPA. Doenças respiratórias foram as principais causas de internação (33%). Apenas 19,1% eram funcionalmente independentes. Pacientes com dependência funcional moderada a grave apresentaram maior necessidade de readmissão hospitalar (p=0,040). Tempo de internação até encaminhamento para hospital referência (p=0,011) foi um fator independente associado a um maior tempo de internação hospitalar. **Conclusão:** verificou-se que os pacientes internados na enfermaria nas primeiras 24 horas apresentaram um baixo nível funcional. Pacientes com dependência funcional, quando comparados aos independentes, apresentaram uma maior taxa de readmissão.
Palavras-chave: Estado funcional; Atividades Cotidianas; Tempo de Internação; Admissão do Paciente; Pacientes Internados.

Resumen:
Objetivo: caracterizar el estado funcional de los pacientes ingresados en una enfermería de clínica médica y comparar las variables clínicas según el nivel funcional, y comprobar si un nivel funcional bajo se asociaba a peores resultados clínicos. **Método**: estudio transversal, descriptivo y cuantitativo realizado con pacientes adultos ingresados en un hospital universitario de mayo a julio de 2019. La independencia funcional se evaluó mediante el Índice de Barthel. Los pacientes se agruparon según su puntuación en el Índice de Barthel: dependencia grave (<60 puntos), dependencia moderada (entre 60 y 80 puntos) e independiente (>85). Las variables entre los grupos se analizaron mediante la prueba de Chi-cuadrado y ANOVA. Las variables asociadas a la duración de la estancia hospitalaria se analizaron mediante regresión lineal múltiple. **Resultados**: Se incluyeron 97 pacientes. De ellos, el 52,5% eran mujeres, con una edad media de 63,3(17,7) años y 86 (88,7%) tenían comorbilidades. La mayoría de los pacientes (85,6%) fueron remitidos desde la Unidad de Cuidados de Urgencias. Las enfermedades respiratorias fueron la principal causa de hospitalización (33%). Sólo el 19,1% eran funcionalmente independientes. Los pacientes con dependencia funcional de moderada a grave tenían mayor necesidad de reingreso hospitalario (p=0,040). La duración de la estancia hasta la derivación a un hospital de referencia (p=0,011) fue un factor independiente asociado a una estancia hospitalaria más larga. **Conclusión**: Se observó que los pacientes ingresados en la enfermería en las primeras 24 horas tenían un nivel funcional bajo. Los pacientes con dependencia funcional, en comparación con los pacientes independientes, presentaron una mayor tasa de reingresos.
Palabras clave: Estado functional; Actividades Cotidianas; Tiempo de Internación; Admisión del Paciente; Pacientes Internos.

Corresponding Author: Fernanda Regina de Moraes – fernanda.moraes@uniube.br

1. Master's Program in Physical Education. Universidade Federal do Triângulo Mineiro. Uberaba Regional Hospital. Uberaba/MG, Brazil
2. Master's Program in Physical Education. Universidade Federal do Triângulo Mineiro. Uberaba/MG, Brazil
3. Mário Palmério Hospital Universitário. Uberaba/MG, Brazil
4. Physical Therapy Course. Universidade de Uberaba. Uberaba/MG, Brazil

INTRODUCTION

Functionality refers to an individual's ability to perform activities ranging from self-care to those that require strength and mobility[1]. Functionality is often compromised in hospitalized patients, whether as a result of hospitalization or a previous condition. Identifying a patient's functional status is crucial, as it enables the implementation of measures to prevent impairments before hospitalization, reduce those that may arise during hospitalization, lower the risk of complications, and enhance the patient's quality of life[2-5].

Approximately 40% to 65% of hospitalized patients have functional impairment days before their admission[6]. Patients who have functional impairment, whether preexisting or acquired in hospital, have a higher risk of death[7]. The presence of functional limitations, especially in elderly patients, is associated with increased mortality in those with hip fractures[8] and lung infections[9,10]. Furthermore, functional decline appears to be a factor associated with hospital readmission, especially in older patients[11-14].

Low pre-admission functional status is a risk factor for hospital readmission[15]. Thus, strategies to prevent readmission can improve quality and reduce hospital costs[16,17]. Because the patient's functional status is unknown at admission, it is difficult to determine whether any disabilities were acquired during hospitalization. The functional level fluctuates during the course of the disease and should be interpreted in the context of each patient's baseline[18]. Readmission rates, mortality, healthcare costs, and institutionalization are all linked to a patient's functional status before and during hospitalization, making this information valuable for predicting hospital outcomes[19].

There are several scales used to assess functional status, with the Barthel Index (BI) being one of the most widely used. Originally developed to measure the independence of elderly individuals in activities of daily living (ADLs)[20], it has since been updated to accommodate various populations and settings, including hospitals. The scale assesses a range of activities, from basic hygiene tasks to more physically demanding activities like climbing stairs.

Therefore, this study aims to characterize the functional status of patients admitted to a medical clinic ward and compare clinical variables according to functional level and verify whether a low functional level was associated with worse clinical outcomes.

METHODS

This cross-sectional, descriptive, and quantitative study was conducted with patients admitted to a medical clinic ward at a philanthropic university hospital serving patients of the Unified Health System (*Sistema Único de Saúde* - SUS) in Uberaba, MG, Brazil, between May and July of 2019. The study was approved by the Research Ethics Committee (CEP) of the Universidade de Uberaba (UNIUBE) under number 3.325.045.

The study included patients aged ≥18 years of both sexes, admitted for a maximum period of 24 hours to the medical clinic ward. Patients with neuromuscular diseases, in palliative care, with agitation, confusion, and/or any other conditions that made assessment impossible were excluded.

For sociodemographic characterization, data regarding sex, age, clinical diagnosis, and city of origin were collected from medical records. As this hospital only receives patients referred from other services, we gathered information on the medical units from which patients were referred (Emergency Care Unit, other hospitals). We also collected the length of hospital stay and outcome of the hospitalization (death or discharge).

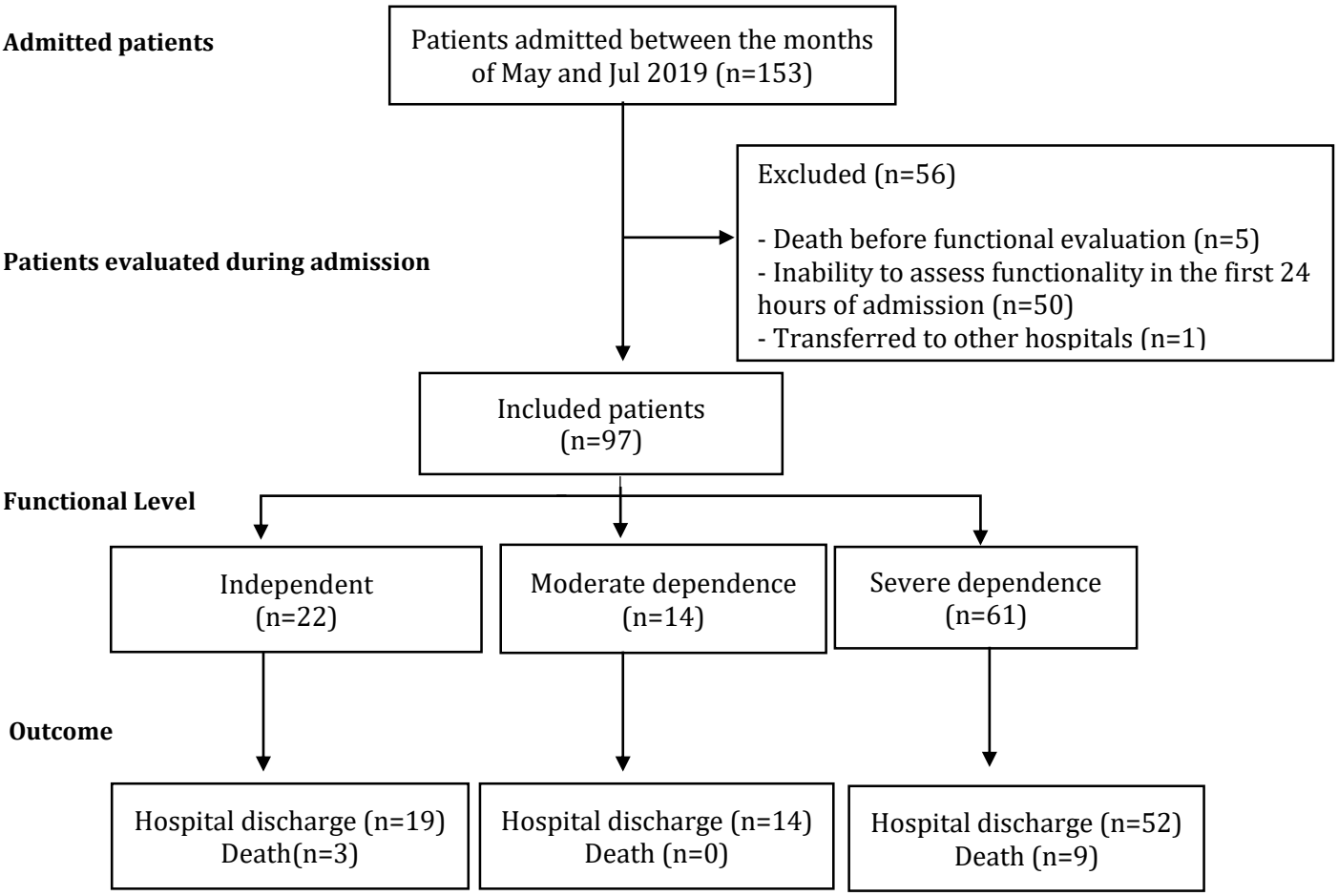
Functional independence was assessed using the Barthel Index, a translated and validated questionnaire in Brazil that consists of 10 items. These items assess activities such as bathing, personal hygiene, eating, dressing, bowel and bladder control, toilet use, climbing stairs, and mobility. The final score is given by the sum of the points for each item, ranging from zero (complete dependence) to 100 (independence)[11]. To categorize patients according to their functional level after assessment using the Barthel Index, the proposal established by Granger *et al* (1979)[21] was used: a score below 60 corresponds to severe dependence, a score between 60 and 80 characterizes moderate dependence, and a score equal to or greater than 85 represents independence[22]. The questionnaire was administered directly to the patient in an interview format by a physical therapist.

The Shapiro-Wilk test was used to assess the normality of the data. Descriptive statistics were used to summarize categorical variables with frequencies (f) and proportions (%), and numerical variables with means and standard deviations or medians and interquartile ranges. The chi-square test was used to compare categorical variables among patients according to their functional level. Numerical variables were compared among patients according to their functional level using ANOVA. Multiple linear regression was used to identify variables associated with the length of hospital stay. The dependent variable was length of stay, while the independent variables included age, Barthel Index score, and days of previous hospitalization. The level of statistical significance used for all tests was $p < 0.05$.

RESULTS

Between May and July of 2019, 153 patients were admitted to the internal medicine ward, of whom 97 were included in the study. Figure 1 shows the patient inclusion flowchart.

Figure 1. Flowchart of inclusion of study patients. Uberaba/MG, Brazil, 2019.



Most patients included were female (n=51), with a mean age of 63.3 (17.7) years, and 86 (88.7%) had at least one comorbidity, with Systemic Arterial Hypertension (SAH) (n=56; 57.7%) and Diabetes Mellitus (DM) (n=30; 30.9%) being the most prevalent. Furthermore, 83 (85.6%) patients came from the Emergency Care Unit (*Unidade de Pronto Atendimento* - UPA), and respiratory diseases were the main cause of hospitalization (n=32; 33%). Regarding the functional level, only 19.1% of the patients were functionally independent. Patients with moderate and severe functional dependence, when compared to independent patients, had a greater need for hospital readmission (p=0.040). Table 1 describes the demographic and clinical characteristics of the patients included in the study according to the functional level.

Table 1. Distribution of demographic and clinical characteristics of patients included in the study according to functional level. Uberaba/MG, Brazil, 2019.

Variables	Functional Level			
	Independent (n=22)	**Moderate dependence (n=14)**	**Severe dependence (n=61)**	***p value***
Age, average (SD), anos	65 (19.1)	67.7 (13)	61.7 (18.1)	0.466
Age > 60 years, n (%)				0.885
Yes	14 (63.6)	10 (71.4)	40 (65.6)	
No	8 (36.4)	4 (28.6)	21 (34.4)	
Sex, n (%)				0.406
Female	9 (40.9))	7 (50)	35 (57.4)	
Male	13 (59.1)	7 (50)	26 (42.6)	
Comorbities, n (%)				0.375
Yes	21 (95.5)	13 (92.9)	52 (85.2)	
No	1 (4.5)	1 (7.1)	9 (14.8)	
Most common comorbities, n (%)				
Systemic Arterial Hypertension	15 (68.2)	9 (64.3)	32 (52.5)	0.376
Diabetes Melitus	10 (45.5)	5 (35.7)	15 (24.6)	0.185
COPD	3 (13.6)	4 (28.6)	16 (26.2)	0.411
Heart Failure	4 (18.2)	5 (35.7)	15 (24.6)	0.502
Chronic Kidney Disease	1 (4.5)	3 (21.4)	4 (6.6)	0.219
Diagnosis on admission, n (%)				0.596
Respiratory diseases	6 (17.3)	6 (42.9)	20 (32.8)	
Heart diseases	1 (4.5)	0 (0)	12 (19.7)	
Kidney diseases	3 (13.6)	2 (14.3)	8 (13.1)	
Neurological diseases	2 (9.1)	1 (7.1)	4 (6.6)	
Gastrointestinal diseases	5 (22.7)	1 (7.1)	4 (6.6)	
Skin diseases	1 (4.5)	2 (14.3)	5 (8.2)	
Metabolic diseases	1 (4.5)	1 (7.1)	4 (6.6)	
Other	3 (13.6)	1 (7.1)	4 (6.6)	
Origin, n (%)				0,487
UPA	18 (81.8)	11 (78.6)	54 (65.1)	
Other hospitals	1 (4.5)	1 (7.1)	3 (4.9)	
Outpatient clinic	1 (4.5)	2 (14.3)	3 (4.9)	
Hemodyalisis center	2 (9.1)	0 (0)	1 (1.6)	
Referral admission, n (%)				0,216
Yes	19 (86.4)	11 (78.6)	57 (65.5)	
No	3 (13.6)	3 (21.4)	4 (6.6)	
Days of hospitalization until referral, median (IQR)	3 (1.7-5)	5 (1.5-12)	5 (3-8)	0,646
Readmission, n (%)				0,040*
Yes	2 (9.1)	6 (42.9)	11 (18)	
No	20 (90.9)	8 (57.1)	50 (82)	
Days of hospitalization, median (IQR)	7.5 (4-14.2)	9.5 (6-20.5)	11 (7-17)	0,646
Admission outcome, n (%)				0,312
Discharge	19 (86.4)	14 (100)	52 (85.6)	
Death	3 (13.6)	0 (0)	9 (14.8)	

Abbreviations: SD, standard deviation; COPD, chronic obstructive pulmonary disease; IQR, interquartile range; UPA, emergency care unit (*Unidade de Pronto Atendimento*). *p<0.05

In the multiple linear regression analysis, the length of pre-hospital stay (p=0.011) was an independent factor associated with a longer length of hospital stay (Table 2).

Table 2. Multiple linear regression analysis for factors associated with length of hospitalization. Uberaba/MG, Brazil, 2019.

Predictive variables	Length of hospitalization, days			
	B	t	CI 95%	p
Age, years	0,101	1,02	-0,05 - 0,15	0,308
Barthel Index, points	-0,118	-1,18	-0,10 - 0,02	0,240
Pre-hospital stay, days	0,258	2,58	0,09 - 0,75	0,011

Abbreviations: CI, confidence interval. β= regression coefficient

DISCUSSION

The main findings of this study were: (I) most patients admitted to the ward had low functional level; (II) patients with low functional level had a higher rate of hospital readmission; (III) the longer the previous hospitalization time, the longer the hospital stay.

This study included a predominance of female patients (52.5%), elderly patients (age > 60 years), and a high prevalence of comorbidities (88.7%). These data are in line with a study that described the sociodemographic, clinical and functional profile of patients in the wards of university hospitals in the city of Belo Horizonte. Although there was no prevalence in relation to sex (50% male and 50% female), a predominance of elderly patients and a high prevalence of comorbidities was reported, with Arterial Hypertension (45%) and Diabetes Mellitus (26.5%) being the most frequent[23].

The results of this study differ from those of others, which can be explained by the following reasons: 1) the study included patients aged 18 years or older, while other studies selected a specific age range (age>60 years)[24]; 2) there was no selection of a specific disease group, some studies analyzed a group with a specific disease, such as respiratory[25].

There were several reasons that led patients to be admitted to the hospital, with cardiorespiratory and kidney diseases being the most prevalent. In a study that described the profile of clinical and surgical hospitalizations in general hospitals of the Fundação Hospitalar do Estado de Minas Gerais (FHEMIG) network, like this one, diseases of the respiratory system were identified as the main cause of hospitalization[26].

The profile of diseases that lead to hospitalization varies according to the type of unit studied. In this study, patients in a clinical care ward were evaluated. Another study assessed several sectors and found that 26.5% of hospitalizations were due to cardiovascular diseases, 21% neurological diseases and 15% oncological diseases[23].

Upon admission to the ward, patients already had some change in their functional level; only 19.1% of patients had mild limitations or were functionally independent. Functional

changes can occur between the onset of the disease and the time of hospitalization[27]. Functional changes can occur from the onset of the disease until hospitalization. These data may reflect the time patients spent in other healthcare units, particularly in UPAs, totaling 85.5%, with 89.7% remaining hospitalized for at least 1 day before being referred to the hospital.

Furthermore, the association between the waiting time until being referred to the hospital and the length of hospital stay showed that the longer the waiting time, the longer the patient remained in the hospital. Published data on changes in the functional capacity of elderly individuals during hospitalization show that most patients, when admitted, already have a significantly reduced functional capacity[24].

These data are important for screening purposes, since, in patients considered frail, especially elderly individuals, the length of hospital stay is a predictor of mortality[28]. A systematic review with meta-analysis, which investigated whether frailty in elderly individuals upon hospital admission predicted adverse outcomes, found that a high prevalence of frailty upon hospital admission increases the risk of functional decline upon discharge, mortality (overall, in-hospital, medium and long term) and length of hospital stay[29].

Although there was no statistically significant difference, patients with greater functional impairment had more comorbidities in this study, which is consistent with the fact that patients who typically present reduced functionality tend to have more comorbidities[30].

The assessment of functional independence may be a determinant of hospital mortality[31]. However, this study did not find an association between functional independence and mortality, unlike another study, in which individuals with dependence, especially severe ones, have a high probability of dying during hospitalization[31]. A possible explanation for this result may be the presence of a sample composed of less severe patients, although this data was not measured.

This study found that patients with moderate to severe functional dependence had higher readmission rates, consistent with findings from a systematic review showing that functional disability is a risk factor for readmission[32]. Previous data have already demonstrated a relationship between functional status and hospital readmission[33].

Patients with the lowest functional scores have a probability of readmission up to 300% higher compared to those with higher scores after adjusting for other known factors, such as comorbidities, age and severity of the disease[18]. In a study that sought to evaluate the relationship between functional status and all-cause hospital readmissions within 30 days, using a representative sample of the United States population, it was reported that baseline physical function is associated with hospital readmissions, and that the Short-Form 12-Item

Health Survey (SF-12) improves the ability to identify patients at high risk of hospital readmission[34].

In another study with patients from a rehabilitation center located at Johns Hopkins Hospital, functional status at admission was strongly associated with readmission to acute care, especially in motor aspects[35]. These data highlight the importance of identifying patients with functional disability and including them in a rehabilitation program, given that these readmissions are related to increased hospital costs[36].

CONCLUSION

Patients admitted to the ward, irrespective of the underlying cause, exhibited low functional levels during the first 24 hours after admission. Patients with functional dependence, compared to those who are independent, have higher readmission rates. Additionally, the duration of prior hospitalization, before referral to the hospital where this study took place, was an independent factor associated with the length of stay.

This study has limitations. First, its cross-sectional design limits the ability to establish causal relationships. Additionally, as a single-center study, the findings may not be easily generalized. The lack of functionality assessments at the time of discharge also prevented an analysis of how hospitalization impacted patients' functional capacity.

Despite these limitations, the study also has notable strengths. Notably, it was able to assess the impact of previous hospitalization at other institutions on the length of hospital stay. The findings show that longer waiting times for transfer to a referral hospital were associated with extended stays.

Given that most SUS hospitals receive patients transferred from other services, these findings highlight the urgent need to reduce waiting times. Additionally, by showing that patients aged 18 years or older present functional limitations upon admission, limitations linked to poorer outcomes, the study contributes to expanding the body of evidence on this issue beyond the elderly population, a focus of previous studies.

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