

Factors associated with functional decline in hospitalized patients

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Abstract

Objective: to describe the factors associated with functional decline in elderly people hospitalized in a tertiary care hospital and propose possible interventions.

Method: this was a descriptive, observational study with an analytical component of patients over the age of 65 who were admitted to a geriatric unit. The dependent variable was the presence of functional decline during hospitalization, and the independent variables were the demographic data, baseline status, nutritional status, inpatient physical therapy and hospital outcomes. The data were analyzed in a univariate logistic regression model, and a multivariate logistic regression model was applied to control for the effect of the other variables.

Results: of the 833 individuals enrolled in the study, the mean age was 85.28 years (SD 4.46), 56.85% were women, 66.51% were malnourished, 49.33% were mildly dependent, 32% had prior dementia, the median length of stay was 5 days (IQR 3-8) and 43.58% experienced functional decline during their hospitalization. The multivariate logistic regression showed an association between in-hospital functional decline and older age (OR=1.04 CI 1.00-1.07), length of hospital stay (OR=1.12 CI 1.08-1.16), and a history of dementia prior to admission (OR=1.41 CI 1.03-1.92), and an inversely proportional relationship to inpatient physical therapy (OR=0.45 CI 0.32-0.62).

Discussion: older age, prolonged hospital stays and dementia prior to admission are factors associated with in-hospital functional decline, while receiving physical therapy is related to a lower likelihood of this type of decline. (*Acta Med Colomb* 2024; 49. DOI: <https://doi.org/10.36104/amc.2024.2943>).

Keywords: *limited mobility, hospitalization, activities of daily life, geriatric assessment, elderly.*

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Introduction

In-hospital functional decline (IFD) is defined as the loss of the ability to perform at least one basic activity of daily living after a hospitalization, taking the baseline situation two weeks prior to the onset of the illness as the reference point (1). This condition has become increasingly important over the last few decades due to its high incidence both globally as well as nationally, affecting up to 70% of elderly people discharged from the hospital (2).

Age, length of hospitalization and the burden of disease are among the risk factors that have been proven to play an important role in the onset of IFD (3). Elderly people's baseline status plays an essential role, including aspects like multimorbidity, functional disorders prior to admission, institutionalization, prior cognitive impairment, sensory deficit, emotional disorders and social risk (4, 5). An incidence of IFD of up to 41% has been reported in Colombia, with a

reported prevalence that may reach 67%, with risk factors being prolonged hospital stay, polypharmacy and lack of family support (6).

The most significant implications of IFD include prolonged hospital stay, readmissions, institutionalization and, in line with some studies, increased mortality, a higher burden of disease and reduced quality of life for elderly people and their caregivers (4).

The objective of this article is to describe the factors associated with functional deterioration during hospitalization in elderly people who received care at a tertiary care hospital, and to propose possible interventions.

Methodology

Study design

This was a descriptive observational study with an analytical component.

Study population

The study population was composed of patients hospitalized for medical reasons in the geriatric unit at Hospital Universitario San Ignacio in Bogotá, Colombia from 2018 to 2020.

Sample and sampling

The sample size was determined using the formula for estimating a population proportion. The following parameters were used: $\alpha = 0.05$ probability of a type I error; P = an expected population proportion of 0.1 and 0.3; and $e = a 20\%$ percentage around the proportion. A minimum required sample size of 242 patients who had the outcome was obtained.

To meet the inclusion criteria, patients had to be over the age of 65, hospitalized in the geriatric unit during the period between January 2018 and April 2020, and have a Barthel index recorded at both hospital admission and discharge.

The patients who met the exclusion criteria were older adults hospitalized for psychiatric illnesses; patients with incomplete or missing data for any measurement interval; missing admission or discharge data in the data base; those who requested voluntary discharge against medical advice; individuals referred to other institutions; and patients who were dependent for the six basic activities of daily living and therefore did not have the potential for functional decline during hospitalization.

Variables

The dependent variable was the presence of functional decline during hospitalization, defined as a loss of the ability to perform at least one of the basic activities of daily living compared to the baseline situation (two weeks prior to the onset of the acute illness) (7).

The independent variables evaluated were grouped as follows: demographics with age and sex; baseline situation, nutritional status, Barthel index prior to admission (8), level of dependence in basic activities according to the score obtained on the Barthel index, modified Lawton index, and the level of independence in instrumental activities; a diagnosis of dementia prior to admission, the social situation (9), the Hospital Admission Risk Profile (HARP) score, the Identification of Seniors at Risk (ISAR) score, polypharmacy (five or more medications) and physical therapy during hospitalization. Hospital outcomes included length of stay, complications and delirium, and readmission.

The Mini Nutritional Assessment - Short Form (MNA®-SF) (10) was used as a continuous variable to measure the nutritional status, with cut-of points equal to or greater than 12 indicating an adequate nutritional status, and greater than 7 and less than 12 for malnutrition and risk of malnutrition. At the mental level, delirium was measured with the Confusion Assessment Method (CAM), with those meeting three or more criteria considered to have delirium (11). For dementia, a prior diagnosis was established according to the history or with findings on a screening test.

A semi-structured interview was performed to evaluate the social situation, asking about the presence or absence of a support network (9). The HARP scale, measured as a continuous scale, classifies patients as being at high risk (4-5 points), intermediate risk (2 or 3 points) and low risk for functional decline (0-1 points) (12). The ISAR scale, also measured continuously, identifies patients at high risk for functional decline when they score two or more points (13). Polypharmacy was defined as taking five or more medications. Age and sex were considered to be confounding variables.

Procedures

The sample was completed through a medical chart review of elderly patients hospitalized in the geriatric unit at Hospital Universitario San Ignacio between January 2018 and April 2020, identified through the list of patients hospitalized by the geriatrics service, and complementing this information with the electronic medical chart identification system. The data obtained were recorded in a database constructed according to the variables included in the protocol. To ensure data protection, this database was stored in a protected electronic medium to which only the investigators had access, with data anonymization.

Statistical analysis

This is a descriptive analysis of information from the variables of interest, using measures of central tendency and dispersion. The mean, median, standard deviation and interquartile range were also used depending on the criteria for normal or non-normal distribution, using the Shapiro-Wilks test. Categorical variables are presented in frequency tables.

For the bivariate analysis, a level of significance or p value less than 0.05 was used. For measures of association, dichotomous variables were analyzed using Chi square, and continuous variables using the Mann-Whitney U test, in order to determine if there were statistically significant differences. Finally, for logistic regressions, a binary and an adjusted model were constructed. For the latter, the presence of functional decline during hospitalization was used as the dependent variable, with the independent and confounding variables mentioned previously. The analysis was done using the STATA 16.0 statistical program.

Ethical responsibilities

According to the Scientific, Technical and Administrative Guidelines for Healthcare Research (Ministry of Health Resolution No.008430 of 1993), this study was considered to be minimal risk, since it is a chart review study with database creation, and no intervention is required. The data privacy of the individuals included in the study was protected, ensuring that the information recorded in the database was anonymous.

Data collection was carried out at an establishment appropriate for this purpose, moderated by a professional suf-

ficiently qualified for the assigned functions, fully meeting all the guidelines required by Bogotá's Secretariat of Health.

The study was approved by the Research and Ethics Committee at Hospital Universitario San Ignacio and Pontificia Universidad Javeriana.

Results

A total of 833 subjects were studied, with a mean age of 85.28 years (standard deviation [SD] 4.46); 473 were female (56.85%), 554 were malnourished (66.51%), 412 were mildly dependent for basic activities of daily living (49.33%), 267 had a prior diagnosis of dementia (32.09%), 499 met the criteria for polypharmacy (59.98%) and 295 received physical therapy during their hospital stay (35.41%). Regarding the HARP scale, 353 patients were at high risk (42.38%), and on the ISAR scale, 576 subjects were likely to experience functional decline during hospitalization. The median hospital stay was five days (interquartile range [IQR] 3-8). Twenty-six participants had complications (3.12%), 201 developed delirium (24.16%) and 98 were readmitted within 30 days (11.76%). A total of 363 had functional decline during hospitalization (43.58%), as can be seen in Table 1.

An evaluation of the factors associated with functional decline showed statistically significant differences with older age (odds ratio [OR]=1.03 CI 1.00-1.07), malnutrition (OR=1.47 CI 1.10-1.98), a lower modified Lawton Index score (OR=0.96 CI 0.93-0.99), having dementia prior to admission (OR=1.48 CI 1.11-1.99), a higher HARP (OR=1.34 CI 1.17-1.48) and ISAR (OR=1.32 CI 1.17-1.48) score, and having received inpatient physical therapy (OR=0.44, CI 0.32-0.59). Likewise, the outcomes were associated with length of hospital stay (OR=1.12 CI 1.08-1.17), complications (OR 3.65 CI 1.51-8.78) and delirium (OR 2.06 CI 1.49-2.84); these data are itemized in the bivariate analysis in Table 2.

The multivariate logistic regression showed an association between functional decline during hospitalization adjusted by sex, and older age (OR=1.04 CI 1.00-1.07), having dementia prior to admission (OR=1.41 CI 1.03-1.92) and a longer hospital stay (OR=1.12 IC 1.08-1.16). Receiving inpatient physical therapy was associated with a lower likelihood of developing IFD (OR=0.45 CI 0.32-0.62), as shown in Table 3.

Discussion

This study deals with the factors associated with functional decline during hospitalization in elderly people who were cared for at a tertiary care institution. We found a 43.58% prevalence of IFD, which was significantly related to a history of things like malnutrition and dementia, and older age. It was also associated with longer hospital stays, more complications and delirium, with inpatient physical therapy being a protective factor.

Recent studies have reported similar findings to those of our study (14), highlighting the directly proportional

Table 1. Characteristics of the study population.

Variables	n (%)
Demographics	
Age (mean and SD)	85.28 (SD 4.46)
70-74	10 (1.20)
75-84	386 (46.34)
≥85	437 (52.46)
Sex	
Female (%)	473 (56.85)
Baseline situation	
<i>Nutritional status</i>	
Normal	279 (33.49)
Malnutrition	554 (66.51)
Barthel Index on admission (median and IQR)	85 (IQR 60-100)
<i>Basic activities of daily living</i>	
Independence	211 (25.33)
Mild dependence	412 (49.33)
Moderate dependence	105 (12.60)
Severe dependence	45 (5.28)
Total dependence	53 (6.33)
Modified Lawton Index (median and IQR)	7 (3-11)
<i>Instrumental activities</i>	
Independent	93 (11.16)
Prior dementia	267 (32.09)
<i>Social situation</i>	
Good support network	727 (87.27)
Poor support network	106 (12.74)
<i>HARP Scale (median, IQR)</i>	
Low risk	3 (IQR 2-4)
Intermediate risk	174 (20.89%)
High risk	306 (36.73%)
<i>ISAR Scale (median, IQR)</i>	
No risk	353 (42.38%)
Risk	2 (IQR 1-3)
	257 (30.85%)
	576 (69.15%)
Polypharmacy	4.99 (59.98%)
Inpatient physical therapy	295 (35.41%)
Hospital outcomes	
Days of hospital stay (median, IQR)	5 (IQR 3-8)
Complications	26 (3.12%)
Delirium	201 (24.16%)
Readmission	98 (11.76%)
Functional decline during hospitalization	363 (43.58%)
<i>HARP: Hospital Admission Risk Profile, IQR: interquartile range, ISAR: Identification of Seniors at Risk, SD: standard deviation.</i>	

relationship between age and the risk of IFD. Predisposing factors related to nutritional status have also been identified, such as the risk of malnutrition and hypoalbuminemia. These characteristics are linked to baseline functionality for

Table 2. Bivariate analysis of patients with functional decline during hospitalization and independent variables.

Variables	No decline (n=470) n (%)	Decline (n=363) n (%)	P value
Age (mean and SD)	84.94 (SD 4.39)	85.71 (SD 4.53)	0.013
Female sex	269 (57.23%)	204 (56.35%)	0.799
Malnutrition	295 (62.7%)	259 (71.35%)	0.009
Barthel on admission (median and IQR)	85 (IQR 60-100)	85 (IQR 60-95)	0.127
Modified Lawton (median and IQR)	7 (IQR 4-11)	6 (IQR 3-10)	0.030
Dementia	133 (28.30%)	134 (37.02%)	0.008
Poor support network	65 (13.86%)	41 (11.29%)	0.271
HARP (median and IQR)	3 (IQR 1-4)	3 (IQR 2-4)	<0.001
ISAR (median and IQR)	2 (IQR 1-3)	2 (IQR 2-3)	<0.001
Polypharmacy	277 (59.06%)	222 (61.16%)	0.541
Inpatient physical therapy	204 (43.4%)	91 (25.07%)	<0.001
Days of hospital stay (median and IQR)	4 (IQR 2-6)	6 (IQR 4-9)	0.033
Complications	7 (1.49%)	19 (5.23%)	0.002
Delirium	86 (18.34%)	115 (31.68%)	<0.001
Readmission	59 (12.55%)	39 (10.74%)	0.422

HARP: Hospital Admission Risk Profile, IQR: Interquartile Range, ISAR: Identification of Seniors at Risk, SD: Standard Deviation.

Table 3. Multivariate analysis.

Variable	Raw OR (95% CI)	P value	Adjusted OR * (95% CI)	P value
Age	1.03 (1.00-1.07)	0.014	1.04 (1.00-1.07)	0.016
Malnutrition	1.47 (1.10-1.98)	0.009	-	
Modified Lawton	0.96 (0.93-0.99)	0.031	-	
Dementia	1.48 (1.11-1.99)	0.008	1.41 (1.03 -1.92)	<0.001
HARP Scale	1.34 (1.13-1.59)	<0.001	-	
ISAR Scale	1.32 (1.17-1.48)	<0.001	-	
Complications	3.65 (1.51-8.78)	0.004	-	
Inpatient physical therapy	0.44 (0.32-0.59)	<0.001	0.45 (0.32-0.62)	<0.001
Days of hospital stay	1.12 (1.08-1.17)	<0.001	1.12 (1.08-1.16)	<0.001
Delirium	2.06 (1.49-2.84)	<0.001	-	

CI: Confidence Interval, HARP: Hospital Admission Risk Profile, ISAR: Identification of Seniors at Risk, OR: Odds Ratio. * Adjusted by sex

basic and instrumental activities, a history of falls, the use of mobility aids, and cognitive components like dementia and delirium on hospital admission. Generally, the higher the burden of disease, the higher the risk of IFD.

These findings could contribute to early identification, even in the emergency room, of patients with a higher likelihood of developing IFD, allowing clusters or phenotypes of at-risk patients to be developed in future studies (15). These could be used to provide more specific management according to patients' baseline clinical characteristics and determine probable short and medium-term prognostic functional trajectories (16), seeking to provide anticipatory

solutions in some cases, like the need for mobility aids and specific technical and human requirements for rehabilitation processes, as well as a prompt search for special care units.

It is striking how the identification of various geriatric syndromes, whether dementia, malnutrition or delirium, can have prognostic implications which are well-established in the literature and notable in the IFD setting (17). These conditions are carefully and routinely sought out in the standard comprehensive geriatric evaluation of acute geriatric units, with better clinical and functional outcomes compared to hospital units that lack this care model (18).

The relationship between IFD and a longer hospital

stay, with its associated medical consequences, has been described in the literature (6, 19). Our study shows that inpatient physical therapy is a protective factor against IFD, with advantages in several domains such as the physical, cognitive and functional domains (20, 21). These findings concur with previous studies which have even shown that a multimodal exercise program can revert IFD-related changes (22).

Some limitations of this study lie in the way in which basic activity functionality was measured, and this is related to the psychometric properties of the most frequently used scales like the Barthel Index which, although it is a universally disseminated, easily applied tool with adequate inter and intra-operator reliability and robust construct validity (23), could have problems with sensitivity to change and the ceiling and floor effect in some patient populations, such as those with dementia (24). This has been shown in some studies using Rasch evaluation, which have found discrepancies between the difficulty of the scale items and a person's actual capacity for that activity (25-27), and this is where scales like the Functional Independence Measure (FIM) could have certain psychometric and even predictive advantages in specific populations, such as stroke patients (28-30).

The results of this study invite all healthcare professionals to identify the risk factors associated with functional decline during hospitalization in elderly patients, which should be used as warning signs beginning with the initial assessment in the emergency room, rather than as composite prognostic indices (31). The study also proposes early interventions such as prescribing physical therapy to prevent IFD.

Conclusion

The factors associated with functional decline during hospitalization are older age, length of hospital stay and having dementia prior to admission. Receiving physical therapy during the hospital stay is associated with a lower likelihood of experiencing IFD.

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