Relationship between hospitalization and functional and cognitive impairment in hospitalized older adults patients

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ABSTRACT

Objectives: To study changes in the cognitive status and dependency of patients aged over 65 years during hospitalization for bone fracture and how these changes relate to the total number of days of admission and absolute rest during hospitalization. Along with cognitive decline, musculoskeletal disorders are considered key factors in this patient population, fractures being one of the most common diagnoses. As well as requiring hospital admission and/or surgical treatment, fractures increase the risk factors that contribute to disability and dependency in older adults. **Method:** A longitudinal case-series study with repeated follow-up assessments was conducted. The sample consisted of 259 older adults. Socio-demographic data was obtained through a semi-structured interview. Furthermore, the following tests were also administered: Barthel Index, Lawton-Brody's scale, Phototest, and Informant Questionnaire on Cognitive Decline in the Elderly. **Results:** The main variable which fosters functional dependency, cognitive decline, and functional loss and diminishes functional gain (both in the hospital and at home) is the number of days of bed rest during hospitalization, rather than the total days of hospitalization. **Conclusions**: The present study reveals that the greater impact on levels of functional dependency and cognitive decline comes from the patient's days of bed rest in hospital, rather than the total

days of hospitalization. These findings could be taken into consideration when discussing post-discharge functional recovery.

Keywords: older adult; gerontology; elder care; hospitalized patients; older patients.

1. Introduction

The way that disease impacts the functional state of older adults is a basic characteristic differentiating them from patients in other age groups (Keeler et al., 2010). Functionality needs to be preserved in older adults and the best care strategy is to avoid its loss. Risk factors for older adults to present cognitive and functional impairment include a hospital stay, comorbidities, polypharmacy, gait disorders, and falls (Keeler, Guralnik, Tian, Wallace and Reuben, 2010; Vidán et al., 2008). These factors –which are common in older adult patients hospitalized for bone fractures– are frequently related to functional and cognitive recovery after discharge.

In this context, musculoskeletal disorders are considered key risk factors for this population, and fractures are one of the most common diagnoses. As well as requiring hospital admission and/or surgical treatment, fractures increase the risk factors that contribute to disability and dependency in older adults (Abianza et al., 2007).

The definition of dependency status, approved by the Council of Europe in September 1998, focuses on three concurrent factors: the existence of a physical, psychological, or intellectual limitation that hinders people's capacities; an inability to perform activities of daily living by themselves; and the need for anyone's help or support for their own care. These elements, according to recent studies (Bakker et al., 2010), should also include hospitalization and concomitant factors.

There is a trend over time and across hospital admissions toward chronicity and disability in hospitalized older adults, which may cause functional and mental loss in the patient after discharge, leading in turn to the reuse of medical care services, mortality, institutionalization, or need for and use of social and healthcare resources. In 1974, the World Health Organization included the "immediate period after hospital discharge" in its definition of risk factors. Therefore, it is important to study the functional gain at discharge, defined as the difference between the level of dependency of older adults at discharge and at hospital admission, and the functional loss, defined as the difference between the level of dependency at discharge and prior to hospitalization (Baztán, Fernandez□Alonso, Aguado and Socorro, 2004; Baztán, Gonzalez, Morales, Vazquez et al., 2004).

Functional deterioration during hospitalization has negative repercussions on older adult patients' quality of life, which is further aggravated by a decline in cognitive abilities, since hospitalization entails a deterioration of social relationships, fosters isolation and depression and increases functional dependency. In extreme circumstances such as bone fractures (Vidán et al., 2008), the hospitalization itself increases mortality risk due to reduced mobility (Delgado-Parada et al., 2009).

The factors and/or modulators that intervene in a situation of functional and cognitive decline during the hospitalization of older adult patients have not been sufficiently examined (Koennecke et al., 2011). A comprehensive assessment of hospitalized older adult patients should include the ability to execute both intellectual and physical tasks.

In this respect, age seems to play an important role. Adults aged over 65 years who are hospitalized for fractures of different etiologies experience the greatest decreases in functional independency. Recent studies pointed out that 35% of adults over 70 years old experienced a significant functional decline during hospitalization (Vos et al., 2012). This percentage increased as age advances and was not subsequently recovered (Dubljavnin-Raspopovic et al., 2013).

Other research studies link cognitive decline of older adults to hospitalization. Pedone, Ercolani, Catani and Maggio (2005) pointed out that cognitive decline in older patients at admission and during hospitalization were associated with a greater risk of functional loss regardless of the age, sex, comorbidities, polypharmacy, and disability at admission. In fact, cognitive decline appeared both as a predictor and as a consequence of functional decline in many studies (Hershkovitz et al., 2007; McGuire, Ford and Ajani, 2006; Sodrquist, 2006). Sands et al. (2003) demonstrated that patients with cognitive decline at admission showed lower rates of recovery 90 days after discharge and a greater likelihood of being admitted to homes for older adults for the first time during the first three months after discharge.

On the other hand, functional decline, as experienced by hospitalized older adult patients, has been linked to decubitus, a low level of social interaction due to long periods of bed rest, and a prolonged hospital stay (Delgado-Parada et al., 2009; Gutiérrez et al., 1999).

Several studies have examined hospital stay as a risk factor in older adult patients (Bakker el al., 2010; Gill, Gahbauer, Murphy, Han and Allore, 2012). Clark, Stump, Tu and Miller (2012) proposed a model in which the number of hospitalizations in the past two years was a predictor of dependency factor for activities of daily living. Lin, Chang and Tseng (2011) examined the rate of hospitalizations and found that longer stays and dependency at discharge were independent predictors of readmission. Other studies suggested that inactivity during the hospital stay in older patients may lead to functional decline, and in-hospital mobility was an important factor related to functional decline (Zisberg et al., 2011). In relation to rest and length of hospital stay, a study of hospitalized patients aged over 65 with hip-bone fractures showed a strong link between the days prior to surgery, when the patients were inactive, and functional and cognitive decline (Calero-García et al., 2012).

However, none of these studies divided the total days of hospital stay according to the mobility and the degree of activity during these days. Patients have different levels of activity in the days prior to treatment or surgery, days immediately following this treatment, or subsequent days of recovery and rehabilitation. In our research, we took these differences into account by dividing the total days of stay according to the events for analysis.

In light of the above, the objective of this study was to analyze the relationship between total days of admission and days of absolute rest during hospitalization (decubitus, immobility) with variations in the levels of dependency and cognitive decline controlling the role of age in this relation.

The hypotheses of this research were: 1) older patients admitted to hospital experience a loss of functionality and cognitive ability compared with the level they had prior to hospital admission; and 2) this functional and cognitive loss is related to a decrease in activity during hospitalization.

2. Methods

2.1. Participants

The sample initially included 306 older adults, who were residents of southern Spain, consecutively admitted to the *Hospital Neurotraumatológico* in Jaén, Spain, in 2014, with a diagnosis of bone fracture. The inclusion criteria were: age 65 years or older, hospitalization due to bone fracture as the primary diagnosis, not having been diagnosed with dementia, length of hospital stay more than 5 days, not having undergone general anesthesia, and not being totally dependent or terminally ill patients. We excluded 47 patients that did not meet the inclusion criteria stated above, so the sample was reduced to 259 participants.

Women comprised 78.4% of the sample and men, 21.6%. A total of 44% were married, 47.5% were widowed, and 8.5% were single.

Ages ranged between 65 and 105 years (*M*=80.37, *SD*=8.352). Participants aged between 65 and 80 years made up 50.2% of the sample (*M*=73.65, *SD*=4.775), and the remaining 49.8% were between 81 and 105 years old (*M*= 87.14, *SD*= 5.062).

Of the total sample, 90% (n=233) had comorbidities. The most common comorbidities were diabetes, renal failure, and hypertension. 204 patients had hip and/or lower limb fractures (78.76%), and 55 had upper limb fractures (21.24%).

2.2. Instruments

The Barthel Index (1979, version by Granger, Dewis, Peters, Sherwood and Barrett, adapted to Spanish by Cid-Ruzafa and Damián-Moreno, 1997) was used to measure the level of dependency. Scores ranges from 1 (completely dependent) to 100 (fully independent). This instrument has good inter-observer reliability (Kappa Index) ranges from .47 to 1.00 and intra-observer reliability (Kappa Index) between .84 and .97. Its internal consistency (Cronbach's α) ranges from .86 to .92 (Cid-Ruzafa and Damián-Moreno, 1977; Roy, Togneri and Pentland, 1988). The study of the validity of BI is limited since it was developed on an empirical basis. However, existing indirect evidences support that it has good construct validity. It is a good predictor of mortality, need of institutionalization, use of social and healthcare services, functional improvement, and risk of falling (Baztán, Pérez & Alarcón, 1993; Cabañero-Martínez et al., 2008).

Instrumental Activities of Daily Living Scale (IADL; Lawton and Brody, 1969) were also used. The score ranges from 0 to 8 points. The maximum IADL score is 0 points, while a score of 8 points expresses total independence. Very high six-month retest reliability of 0.88 (range, 0.80–0.99) has been reported for the IADL scale. The IADL also shows good inter-rater reliability between personnel from different disciplines. The validity of the Lawton IADL was tested by determining its correlation with four scales that measured domains of functional status: the Physical Classification (6-point rating of physical health), Mental Status Questionnaire (10-point test of orientation and memory), Behavior and Adjustment rating scales (4-6-point measure of intellectual, person, behavioral and social adjustment), and the PSMS (6-item ADLs). All correlations were significant at .01 or .05 level (Baztán, González and Del Ser, 1994; Montorio, 1994; Ribera and Cruz, 1977).

Cognitive assessments were performed with the Phototest (Carnero-Pardo and Montoro-Rios, 2004). This tool has the advantages of being brief and not conditioned by educational level, making it applicable to the illiterate. It assesses memory, verbal fluency, and naming. Phototest has high internal consistency (Cronbach's α .94) and good test-retest (r = .89) and inter-observer (r = .98) reliability. Its structure ensures an adequate content validity to directly assess memory, executive capacity (verbal fluency), and naming (language), which are essential cognitive functions whose involvement is required for the diagnosis of cognitive impairment and dementia. The ecological validity is also ensured since the concepts and materials employed are very familiar, even though for illiterates or subjects with a low educational level. Its results show high and significant correlation with results from other short cognitive tests such as Mini-Mental State Examination (r = .50) and Short Portable Mental Status Questionnaire (r = .65) (Carnero-Pardo, Sáez-Zea, de la Vega Cotarejo and Gurpegui, 2012).

The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE, Morales, González-Montalvo, Delser and Bermejo, 1992) was also used to collect primary caregiver's opinions about changes in the cognitive symptoms assessed. The questionnaire was found to have high internal reliability in the general population sample (Cronbach's α = 0·95) and reasonably high test-retest reliability over one year a sample of people with dementia (r = 0·75). The total IQCODE score, as well as each of the 26 items, was found to discriminate well between the general population and people with dementia. The correlation with education was quite small (r = – 0·13), indicating that contamination by premorbid ability is not a problem. The use of this instrument is supported by studies that demonstrate: 1) discriminant validity among healthy older adults with dementia and/or Mild Cognitive Impairment (MCI) when used at 2-year intervals (Enhrensperger, Berres, Taylor and Monsch, 2010) or in an single diagnostic assessment (Cruz-Orduña et al., 2012, Sikkes et al., 2010), and 2) concurrent validity with the Mini-Mental State Examination (Isella, Villa, Frattola and Appollonio, 2002). The score ranges from 1 (the person has improved a lot) to 5 (the person has become much worse). In our study, this information could not be obtained in 4 patients (1.54% of the sample) who had no primary caregiver.

2.3. Design and Procedure

The study design was a longitudinal case-series with repeated follow-up assessments. The dependent variables were the measurements obtained with the instruments described. The BI was given at four temporal moments: 1) prior to admission, through the primary caregiver, who was told to inform about the activities done by the participants 24 hours prior to hospitalization (Barthel Previous); 2) at the time of hospital admission, related to the activities done during the first 24 hours in the hospital (Barthel Admission); 3) at discharge, always after the fifth day of admission and, in any case, the same day of surgery (Barthel Discharge); and 4) post discharge, three months after hospital discharge, when the participant was already living at home (Barthel at home). Also, the IADL and Phototest were administered at the time of hospital admission and post discharge (three months after hospital discharge). On the other hand, the researcher administered the IQCODE to the primary caregiver at the time of hospital discharge so he/she could consider any variation in the patient's cognitive status on the days prior to admission.

Also taken as dependent variables were *functional gain at discharge* (calculated as the difference between the BI obtained at discharge and the BI obtained at hospital admission), *functional gain at home* (difference between the BI obtained in the follow-up home visit and the BI obtained upon hospital discharge), and *functional loss* (difference between the BI at discharge and the BI prior to hospitalization) (Baztán, Fernandez-Alonso, Aguado and Socorro, 2004).

Once approved by the Ethics Committee of the Hospital, we established a system for communicating daily admissions with the clinic staff. We explained the aim of the study to the patients as well as what was expected from their participation, giving them written information and requesting their informed consent (Declaration of Helsinki 2004) as a requirement to be included in the study. All the participants included in this study were able to give their written consent to participate in the study. Once the participant's consent was provided, the first interview took place within 24 hours of hospital admission, provided that the patient's physical condition allowed it.

On the sixth day of hospitalization, the participant was visited again, and a second interview was conducted. A minimum period of 5 days was established according to the Baztán et al. (2004) study on functional gain and length of stay in the hospital, where a stay of 5 and 9 days is required in order for functional gain to be calculated. Finally, check-up was performed at home between 60 and 90 days after discharge. This time period was established based on the study of Batzán et al. (2004), which shows a peak of functional gain in the eighth week. Therefore, we considered the maximum functional recovery occurs between the eighth and twelfth weeks. On the other hand, it was not advisable to extend this time beyond 90 days since another pathology or aggravation may appear and interfere with the results.

Finally, the days of hospital stay and the activity level allowed for each participant were recorded. Patients admitted to the hospital had different levels of activity during their stay, from the absolute repose before a surgical intervention to physical rehabilitation activities during the patient's hospital stay. The days of hospital stay were classified according to their possibilities for mobility and activity. The types identified were *absolute rest* (absolute rest before surgical intervention), *bed rest* (rest after surgical intervention in supine decubitus with no possibility of getting up), *limited mobility* (able to get up but not to walk around), and *total days* of hospitalization (total duration of stay).

2.4. Statistical analysis

We performed an analysis of variance of repeated measures for all participants in order to check whether there were differences between the different functional dependence measurements recorded and the patient's cognitive status. *Post hoc* comparisons were performed using the Scheffé test or T3 Dunett. The effect size was estimated using η_p^2 or Cohen's *d*, and statistical decisions were taken at a level of significance of 0.05 or lower. Analyses were performed with the Statistical Package for Social Sciences software version 19.0 for Windows (SPSS, Chicago, Illinois).

3. Results

3.1. Functional dependency and cognitive decline

The analysis of the variance with repeated measures, using the BI as the dependent variable, identified significant differences in the variable *functional dependency* (F[3/234]=412.850, p<.0001, η_p^2=.640, pw=1.000). Scheffé test showed that these differences were established between all four measurements (p<.001), with a decrease at hospital admission, a mild recovery at discharge that continued until the later home check-up, but with no full recovery of the functionality status prior to the incident that caused hospitalization.

An analysis of the variance also showed significant differences between the scores obtained at hospital admission and post discharge in Lawton-Brody's scale (F[1,234]=111.980, p<.0001, $\eta_p^2 = .325$, pw=1.000) and in Phototest (F[1,234]=4.82, p=.029, $\eta_p^2 = .022$, pw=1.000).

The average IQCODE score for all the participants, which estimated negative changes according to the estimation of caregivers, was 3.62. Only 6.55% of the informants thought their relative had shown some gain after hospitalization compared with their previous condition, 43.66% thought there was no change, and 49.35% considered their condition to have worsened compared with pre-hospitalization.

3.2. Relationship between total days of hospitalization and days of absolute rest or bed rest, and variation in levels of dependency and cognitive decline

Absolute rest days

The total days that older adults patients were in the hospital, from the time of admission for bone fracture until surgery, ranged from 0 days for the most urgent cases to

25 days (Table 1). This variable showed a significant negative relationship with functional gain in the hospital (r_{xy}=−.170; p = .007).

(Table 1 about here)

In order to study the evolution of functional gain as a function of the number of days preceding surgery, we extracted the values of this variable in 5-day intervals. Thus, from 0 to 5 days, we obtained a mean gain value of 10.52 (*SD*=17.59); from 6 to 10 days, the average gain was 11.02 (*SD*=12.53); from 11 to 15 days, the mean was −9.06 (*SD*=5.19); from 16 to 20 days, the mean gain value was −17.5 (*SD*=10.6); and, finally, the average gain was −35.00 (*SD*=10.3) from 21 to 25 days. An univariate analysis of variance using the preceding days re-codified into these five intervals as a factor showed the presence of significant differences in functional gain (F[4,254]=3.004, p=.02, η_p^2=.224, pw=1.000). *Post hoc* comparisons revealed differences between every level except the first two. Therefore, there was functional gain when performing surgery between the first and tenth day of hospitalization, but if it was performed on the eleventh day or later, there was no functional gain but rather a loss; this loss became greater as the number of preceding days increased, as shown in Figure 1.

(Insert figure 1 about here)

Bed rest days

When revising the relationship between the indicators of dependency level (BI, IADL) and cognitive status (Phototest) and the total days of bed rest, both before and after surgery until the patient was able to get up, we found a significant inverse association between this variable and dependency levels and also in cognitive status. Table 2 shows this correlations as well as the relationship between the total days of bed rest and functional gain and loss.

Table 2 about here

In order to control the effect of age in the results, a General Linear Model with repeated measures of the group according to the days of rest (as a factor) was carried out including the age as a covariable. Table 3 shows the descriptive statistics of the dependent variables according to this factor. The multivariate contrasts revealed significant intra-individual differences related to the time of bed rest in Barthel Index (F[6,251] =8.169, p=.0001, η^2 =.068, pw= 1.0000). The interaction of this variable with age did not appear significant (F[3,256]=2.363, p= .080). Regarding the Instrumental Activities of Daily Living, no significant differences were found in the factor (F[2,254]= 2.764, p= .065) and in the interaction with age (F[1,257]=.884, p= .348). The analysis carried out reflected significant differences in the Phototest related to days of bed rest (F[2,256]=3.578, p=.030) and a significant interaction of this factor with age (F[1,258]=7.713, p=.006, η^2= .037, pw= .789). Functional gain also showed significant differences related to the total days of bed rest (F[2,254]=3,056, p= .049, η^2= .027, pw= .586), although the interaction with age was not significant in this case.

(Table 3 about here)

The interindividual ANOVA made with the General Lineal Model with age as a covarible revealed significant differences between the three groups in Barthel Discharge

(F[2/256]=16.881, p<.0001, η_p^2=.131, pw= 1.000) and Barthel at home (F[2/256]=23.982, p<.0001, η_p^2=.177, pw= 1.000). *Post hoc* comparisons revealed a significant recovery for the three groups. No significant differences were found in Barthel Admission.

Regarding the Lawton-Brody´s scale, significant interindividual differences were shown at admission (F[1,255]=4.815, p<.009, η_p^2=.041, pw= .794), although the *post hoc* analysis did not show differences between groups. In relation to the Lawton-Brodys´s scale at home, significant differences were found (F[1,255]= 13.281, p <.0001, η_p^2=.106, pw=.998). According to the *post hoc* analysis, these differences were between the first group (0 to 5 days of bed rest) and the other two groups (6 to 10 and + 11).

Regarding the Phototest, significant differences were found at Admission (F[1,255]=17.640, p<.0001, η_p^2=.148, pw= 1.000) and at Home (F[1,255]= 8.439, p<.0001, η_p^2=.077, pw= .963). *Post hoc* analysis did not reveal significant differences between groups.

An univariate analysis of variance using the preceding days re-codified into these three intervals as a factor showed the presence of significant differences in functional gain at discharge (F[2,254]=15.103, p<.0001, η_p^2=.119, pw=1.000). *Post hoc* comparisons revealed differences between the third group (+11 days) and the other two groups. There were no significant differences in functional loss and functional gain at home between the three groups.

Limited mobility days

Neither cognitive status nor functional dependency was significantly different when compared to the total number of limited mobility days.

Total days of hospitalization

Table 2 shows the relationship between the total days of hospitalization and the indicators of dependency level, cognitive status, functional gain at discharge, functional gain at home and functional loss.

To observe if there were differences in level of functional dependency or cognitive status, the total number of days was divided in two: from day 1 to day 10, and from day 11 onwards. The analysis showed significant differences in the BI upon discharge (F[2,240]=21.982, p<.0001), at home (F[2,240]=22.945, p<.0001), functional loss (F[2,240]=12.041, p =.0001), and Phototest at home (F[2,240]=14.155, p<.0001), implying that older adults hospitalized for more than 10 days experience higher levels of dependency and cognitive decline (see Table 3).

4. Discussion and conclusions

According to the results of this study, older adult patients show increased dependency during hospitalization, with a mild recovery at discharge, without returning to pre-hospitalization levels of functional independence and cognitive status. This agrees with the observations of primary caregivers, as only 5.8% reported a return to baseline in cognitive status. Thus, we confirm findings from similar studies (Delgado-Parada et al., 2009; Formiga and Soto, 2009) affirming a functional loss upon discharge that is not recovered after three months.

An important finding of this investigation is the association between the number of total days hospitalized and days of bed rest during hospitalization and the patient's level of dependency and cognitive decline. In this sense, several previous studies associated the patient's increased dependency and cognitive decline with decreases in mobility as well as the total days of hospitalization (Delgado-Parada et al., 2009). Regarding the primary diagnostic, Inouye et al. (1993) reported that one-third to half of older adult patients who are hospitalized lose function. Other studies suggested that the cause of this deterioration is associated with factors such as prolonged rest in bed (Gutiérrez et al., 1999), absence of mobility (Vidán, 2008; Varela, Chávez, Herrera, Ortiz, and Chigne, 2004), and/or the number of days preceding hip-bone fracture surgery (Calero-García et al., 2012).

Our results seem to confirm that the fewer the days between the patient's admission and the surgical intervention, the better is the functional gain during the recovery. The results also reveals that the days preceding surgery show a significant negative correlation with the BI, which is consistent with a previous study on hip-bone fracture (Calero-García, 2008), and with the Lawton-Brody´s scale after discharge, which shows functional losses that are not recovered at home three months after the hospitalization.

Regarding cognitive status, the results show a significant decline in the Phototest at discharge related to the hospitalization process. Even though, the *post hoc* analysis did not show the meaning of the differences between groups, which reflects that the hospitalization effects are lower in this case. This could be explained by the fact that the days preceding surgery for hip-bone fracture are characterized by immobilization and bed rest. This factor affects the level of dependency as affirmed by Vidán et al. (2008), who mentioned significant differences with bed rest of more than 48 hours, and the study by Varela et al. (2004), which related immobility to cognitive decline.

Regarding the relationship between the total days of hospitalization and levels of functional dependency and cognitive decline, our results concur with those of previous research studies (Delgado-Parada et al., 2009; Gutiérrez et al., 1999; Vidán et al., 2008).

As for functional gain, we can affirm that no matter how long older adult patient's hospital stay was extended, greater functional capacity was not gained. More days in the hospital may be related to higher levels of dependency and functional loss in older adult patients. Similarly, a greater number of days in the hospital preceding surgery is associated with lower functional gain in the hospital. Finally, a greater number of days of bed rest during hospitalization can foster functional dependency, cognitive decline, and functional loss, and diminish functional gain both while in the hospital and at home, particularly for men at home. These results are more noteworthy for functional dependency. In fact, in the Barthel Previous only 3.4% of older adults appeared with a severe dependency, and 80.3% were completely independent. At Barthel Discharge, 20% of the participants had a severe dependency, and 40% appeared as completely independent.

It is also very relevant the result related to age. In this investigation, age only affected the results in the cognitive test Phototest. In this test, there is a significant interaction between the days of bed rest and age. This could be an expected fact, taking into account that cognitive decline is frequently associated with age. These findings, identified through using the cognitive test Phototest, confirm again that the effects of hospitalization worsen as patients get older in cognitive decline (Vos et al., 2012).

In relation to the major limitations of the study, it should be noted that our research was performed at a single hospital, three indices of instrumental skills and cognitive status were used, and we did not take into account other variables (for instance, mental health measures) that may be relevant and could limit the generalizability of the results. For these reasons, it is therefore important to replicate the findings with other samples of older adult patients who are hospitalized, and to expand the pathologies examined.

Despite the abovesaid limitations, the objective and the results obtained in this research are very relevant taking into account the practical implications regarding care practices in hospitalized older adult patients. In this sense, according to the analysis of variance in the levels of dependency and cognitive status, it is evident that older adult patients should be hospitalized only for the strictly necessary period of time. If possible, surgery should be performed during the first 48 hours, and the patient should remain immobilized in bed the minimum possible number of days.

In harmony with the above, the present study identified significant differences in functional gain and functional loss as a function of days of rest; the more days older adult patient are in bed, the lower their functional recovery will be, and there will be a greater functional loss with respect to their condition prior to hospitalization. We observed that from the sixteenth day after hospital admission, gain scores become negative, i.e. they become functional losses, indicating that the number of days of bed rest have an important impact on functional recovery. Although there are no other studies that relate functional gain to days of bed rest, there are some that relate it to functional loss, a factor which Inouye et al. (1993) linked to days that older adult patients are in decubitus and Gutiérrez et al. (1999) linked to prolonged bed rest.

In this respect, the intervention of the nurse in the inpatient unit is essential. If we consider that a prolonged stay in bed is a risk factor for functional and cognitive decline in older adults, it would be desirable to design interventions to expedite hospital discharge of older adults and that favor reducing the number of days that older adults have to be in bed rest during hospitalization through early mobilization programs.

In their assessment, nurses should consider that cognitive impairment may restrain older adult patients' ability to make decisions and perform actions of self-care. Patient education strategies should also be adapted to cognitive ability (Hjelm el al, 2012). In this way, we attempt reduce functional and cognitive impairment, and our interventions have a beneficial impact for hospitalized older adult patients.

Disclosure

All authors report that they have no conflicts of interest.

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Figure 1 Means of the Functional Gain as a function of the days preceding surgery

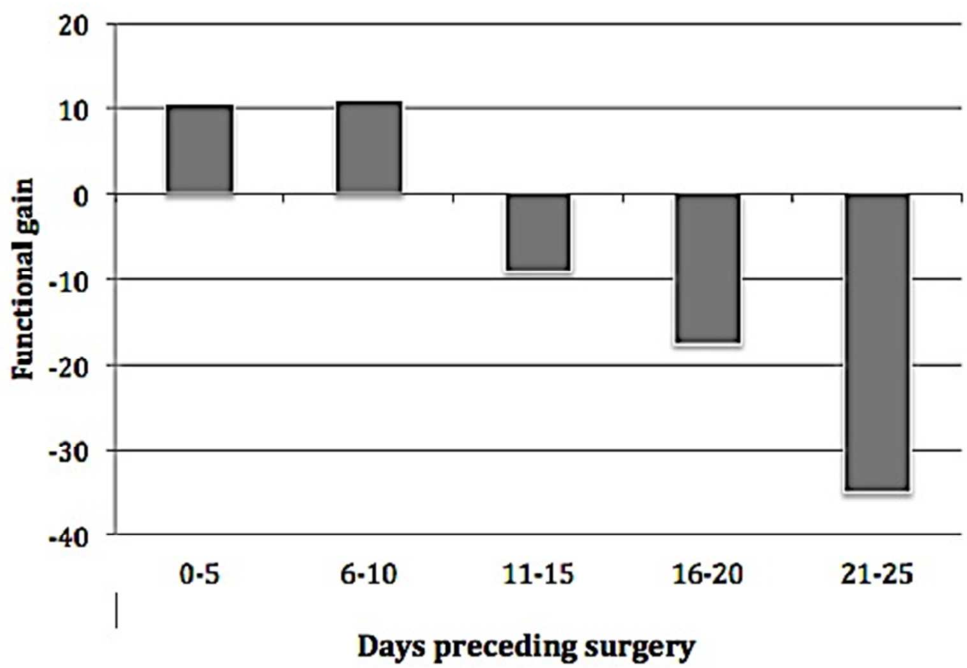

Table 1 Descriptive statistics for total days of admission

	Minimum	Maximum	Median	*M*	*SD*
ABSOLUTE REST DAYS	0	25	6.5	3.37	3.96
BED REST DAYS	0	25	5	6.51	5.52
TOTAL DAYS	5	89	11.14	12.97	8.54

Table 2 Bivariate correlations between total days of bed rest and total days of hospitalization with indicators of dependency level (Barthel Index) and cognitive status (Phototest).

	Bed rest Days	Total Days
BARTHEL ADMISSION	-.093	-.183**
BARTHEL DISCHARGE	-.269**	-.216**
BARTHEL AT HOME	-.320**	-.264**
IADL ADMISSION	-.178**	-.079
IADL AT HOME	-.219**	-.230**
PHOTOTEST ADMISION	-.286**	-.181**
PHOTOTEST AT HOME	-.233**	-.117
FUNCTIONAL GAIN DISCHARGE	-.263**	-.060
FUNCTIONAL GAIN AT HOME	-.108	-.123
FUNCTIONAL LOSS	-.098	-.160*

** $p < 0.01$ (bilateral).
* $p<0.05$(bilateral).

Table 3 Mean and standard deviation of the dependent variables at various time points by total days of bed rest and total days of hospitalization.

		Barthel Previous	Barthel Admission	IADL Admission	Phototest Admission	Barthel Discharge	Functional gain at Discharge	Barthel at Home	IADL at Home	Phototest at Home	Functional gain at Home	Functional loss at Home
BED REST DAYS												
0 – 5 (*n*=129)	*M*	82.802	38.549	4.865	28.92	51.117	12.56	71.403	3.703	29.487	20.68	-31.68
	SD	1.364	1.549	.160	.521	1.134	1.24	1.148	.153	.592	1.13	1.45
6 – 10 (*n*=73)	*M*	66.399	29.249	3.424	22.391	30.506	1.25	47.726	1.507	22.817	17.22	-35.89
	SD	4.221	4.793	.497	1.782	4.127	3.83	4.481	.474	2.025	3.50	4.47
+ 11 (*n*=32)	*M*	68.870	46.673	3.269	11.183	20.580	-26.09	24.968	.873	18.229	4.39	-48.23
	SD	8.647	9.818	1.018	3.565	8.455	7.86	9.178	.971	4.050	7.18	9.17
TOTAL DAYS												
0 – 10 (*n*=123)	*M*	82.301	41.041	4.757	29.118	53.038	11.988	74.623	4.059	29.725	21.585	-30.35
	SD	1.797	1.972	.215	.708	1.761	1.689	1.928	.201	.777	1.461	1.640
+ 10 (*n*=111)	*M*	79.191	33.708	4.476	26.626	43.057	9.391	60.558	2.656	27.608	17.595	-37.12
	SD	1.900	2.085	.227	.767	1.862	1.778	2.038	.211	.841	1.538	2.123

Age as a covariable at 80.25 years old.