Functional Recovery of Elderly Patients Hospitalized in Geriatric and General Medicine Units. The PROgetto DImissioni in GEriatria Study

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OBJECTIVES: To investigate the characteristics of patients who regain function during hospitalization and the differences in terms of functional outcomes between patients admitted to geriatric and general medicine units.

DESIGN: Multicenter, prospective cohort study.

SETTING: Acute care geriatric and medical wards of five Italian hospitals.

PARTICIPANTS: One thousand forty-eight elderly patients hospitalized for acute medical diseases.

MEASUREMENTS: Functional status 2 weeks before hospital admission (baseline), at admission, and at discharge, as measured using the Barthel Index (BI).

RESULTS: Geriatric patients were older (P < .001) and had lower preadmission functional levels (P < .001) than medical patients. Between baseline and discharge, 43.2% of geriatric and 18.9% of medical patients declined in physical function. In the subpopulation of 464 patients who had declined before hospitalization (between baseline and admission), 59% improved during hospitalization (45% of geriatric and 75% of medical patients), whereas only approximately 1% declined further. High baseline function (odds ratio (OR) = 1.03, 95% confidence interval (CI) = 1.02–1.04, per point of BI) and greater functional decline before hospitalization (OR 0.95, 95% CI 0.94–0.97, per % point of BI decline) were significant predictors of in-hospital functional improvement; type of hospital ward and age were not.

CONCLUSION: Although geriatric patients have overall worse functional outcomes, in-hospital functional recovery may be frequent even in geriatric units, particularly in patients with greater preadmission functional loss and high baseline level of function. J Am Geriatr Soc 59:193–199, 2011.

Key words: hospital-related disability; frail elderly

Hospitalization for acute medical illness is a crucial event in the complex process of the functional decline of elderly people.1 Poor nutrition, excessive bed rest, sleep deprivation, and multiple drug treatment are all factors explaining why hospitalization per se is a recognized risk factor for loss of independence in elderly people.1 It is calculated that approximately 30% to 35% of older adults are discharged from hospitals with new activity of daily living disabilities;2–6 this rate may increase to 50% in people aged 85 and older.2 Functional decline is a challenge for healthcare systems, because most patients who are discharged with new disabilities cannot live alone and need continuous assistance at home. In addition, patients with hospital-related disabilities are more likely than those discharged without new disabilities to experience long-term adverse outcomes such as nursing home placement, sustained functional decline, and death.7,8

Functional decline may occur a few days before hospitalization as a consequence of the acute medical illness.3,9 After hospital admission, some patients do not recover to preadmission function, others may decline further in function, but approximately 20% experience significant functional improvement during their hospital stay.3 This in-hospital improvement is expected to be a crucial determinant of the functional outcome caused by the combination of the acute disease and the hospital stay, because people who recover may be discharged with baseline function.
Despite the initial acute decline, but to the knowledge of the authors of the current article, the distinctive features of patients who recover during hospital stay have never been studied. Understanding the mechanisms that underlie a successful hospital recovery may help identify new healthcare strategies to save the function of older hospitalized people.

In many national health systems, elderly patients seen in emergency departments (EDs) because of acute medical problems are usually assigned to geriatric or general internal medicine wards, mostly on the basis of age and the availability of beds, but the potential differences between the functional trajectories of patients admitted to geriatric units and those hospitalized in medical wards have never been investigated. This “real world” observation may be important, even in view of the recent dissemination of a “geriatric” approach to acutely ill older patients based on an integrated comprehensive evaluation aimed at minimizing functional deterioration.

For these reasons, the Società Italiana Geriatri Ospedalieri (SIGOs) performed a prospective cohort study of geriatric and internal medicine units throughout Italy. The aims of this study were to identify factors underlying the capacity to recover physical function during hospitalization and to assess potential differences in terms of functional outcomes between geriatric and general medicine units.

METHODS

Patients and Study Design
The “Progetto Dimissioni in Geriatria” (Project Discharges in Geriatrics, Pro.Di.Ge.) is an observational prospective cohort study of elderly patients hospitalized in three acute geriatric units and two general medicine units of three Italian hospitals. The study enrolled patients aged 65 and older who were consecutively admitted to the five participating centers between November 2004 and January 2006 and followed them until discharge from the hospital. All three hospitals had a geriatric or a medical unit, but in one hospital the medical unit did not participate in the study.

Not all patients were admitted to the hospital through the ED, but the reason for hospitalization was always an acute medical disease. For patients hospitalized after evaluation in the ED, assignment to geriatrics or medicine was not determined according to specific criteria, and the emergency clinicians had to be blinded to the study. The study protocol did not include any change in the model of care that each unit usually provided to elderly patients.

The study initially recruited 1,476 patients, 95 of whom died during hospitalization and were not included in the present study. Another 333 subjects (246 geriatric and 87 medical patients) were excluded because of missing data on functional status, leaving a final study sample of 1,048 patients, corresponding to 76% of patients who survived.

Measurements
A trained study physician collected three sets of data, including demographic and social data, data pertaining to hospitalization and comorbidity, and data describing functional status.

Demographic and social data were date of birth, educational level, marital status, and living alone or not. Data regarding hospital stay were admission from ED, nursing homes, home, or other acute care units from the same or other hospitals; length of stay; destination after discharge; discharge diagnoses (up to 6); and diagnostic and therapeutic procedures (up to 6) coded according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD9-CM).

One critical point of the study was the choice of the test to explore functional status. Although the Katz activity of daily living (ADL) scale is widely used to describe the functional status of elderly patients, it was found that this scale was unable to recognize any meaningful change in functional capacity between admission and discharge from hospital, so it was decided to use the Barthel Index (BI), because it gives more information about ADLs and is sensitive even to small changes in functional capacity.

The BI items can be divided into a group that is related to self-care (feeding, grooming, bathing, dressing, bowel and bladder care, and toileting) and a group pertaining to mobility (ambulation, transfers, and stair climbing). The maximum BI score is 100, indicating that the patient is fully independent in physical functioning. The lowest score is 0, representing a totally dependent bedridden state. A 5-point variation (increase or decrease) represents the minimum change in at least one activity. BI items have previously shown high correlations between self- and informant ratings.

Preadmission baseline BI (BIPre) was measured at admission by asking patients or caregivers (for patients who were unable to respond, such as those with dementia) to report on the patient's functional status as it had been approximately 15 days before hospital admission. The study physician also measured functional status directly at admission (BIAdm) and the day before discharge (BIDis).

Comorbidity was assessed according to the number of diseases listed at discharge according to the ICD9-CM classification. The diseases were grouped into the following seven major categories: cardiovascular, cerebrovascular, neurological, pulmonary, gastrointestinal, cancer, and other.

Dementia as first or subsequent ICD9-CM diagnosis was also considered in the present study. The Ethical Committee of the Israeliitico Hospital, Rome, approved the study.

Analytical Approach and Statistic Analysis
The Kolmogorov-Smirnov test was used to test normal distribution of continuous variables. The mean variation of BI across the three time points (baseline, admission, discharge) was analyzed in the geriatric and medical units (Friedman and Wilcoxon tests), as well as the differences in terms of mean BI between the two units at each time point (Mann-Whitney test). The proportions of patients declining from baseline to discharge and from baseline to admission were calculated in the geriatric and medical units, and the differences between the two groups were assessed using the chi-square test.

The functional trajectories observed between admission and discharge (complete recovery, incomplete recovery,
no change, decline) were then described by calculating the proportions of patients performing each possible in-hospital trajectory. This analysis was mainly limited to the subpopulation of 464 patients who lost physical function between baseline and admission as a likely consequence of the acute illness that caused hospitalization. In this subpopulation, the rates of in-hospital functional recovery in geriatric and medical patients were compared using the chi-square test. The mean age of the group of patients who improved during hospitalization was also compared with that of those who remained the same or worsened (unpaired t-test).

A logistic regression analysis model was obtained to estimate the odds ratios of factors that may be independently associated with the group of patients who improved during hospitalization (dependent variable) in comparison with those who did not improve (including people who worsened and those who remained the same). Improvement during hospitalization was defined as an increase in BI of at least 3 points from admission to discharge. Again, this multivariate analysis was limited to the above-mentioned subpopulation of patients with preadmission decline (n = 464). Selected independent variables that may affect the capacity to improve during hospitalization according to previous studies were included in this model:16–18 age; sex; length of stay; BIpre; number of ICD9-CM diseases; dementia; and admission from ED, home, other hospital acute care units, and nursing homes (the last was the reference category). Admission to geriatric or medical units and “percentage decline BIpre–BIadm,” a negative continuous variable measuring loss of function before hospitalization and calculated as \([\frac{BI_{adm} - BI_{pre}}{BI_{pre}}] \times 100\), were also included as independent variables.

\(P < .05\) was considered significant. Analyses were performed using SPSS 13.0 (SPSS, Inc., Chicago, IL).

RESULTS

Analysis of Missing Patients

BI was not measured at baseline in 223 of the 333 excluded patients, at admission in 251, and at discharge in 253, although for the majority of such patients, the BI measurement was lost for more than one time point (data not shown). For instance, 220 of the 251 patients (87.6%) without a BI at admission lacked a BI at discharge; conversely, of the 1,130 patients with a BI at admission, only 33 (2.9%) lacked a BI at discharge. This suggests that the loss of patients mostly occurred at recruitment, rather than between admission and discharge. The 333 lost patients were significantly older \((P < .001)\), more frequently admitted to geriatric units \((P < .001)\), and female \((P < .001)\) than the final study population of 1,048 patients; they also had lower preadmission BI \((P < .001)\), more ICD9-CM diseases \((P < .001)\), and longer length of hospital stay \((P < .001)\).

Characteristics of the Study Population and Functional Differences Between Geriatric and Medical Units

Table 1 shows the characteristics of all participants and according to whether they were admitted to geriatric or general medicine units.

Most patients were admitted after evaluation in the ED (~ 45%, Table 1). Even though the assignment by the emergency clinicians to geriatric or medical units was not determined according to specific criteria, patients admitted to geriatric units were significantly older and had lower BIpre than medical patients, indicating that this choice was based not merely on bed availability, but also on the clinical features of the patients. As expected, emergency clinicians tended to admit frailer and older patients to geriatric wards much more than to medical units.

Caregivers were needed for the evaluation of preadmission baseline functional status in 25% of all subjects. (No difference was observed between geriatric and medical patients, data not shown.)

As shown in Figure 1, mean BI declined significantly from baseline to admission on the geriatric and medical units \((P < .001\) for both units) and increased significantly from admission to discharge \((P < .001\) for both units). At all time points (baseline, admission, discharge), BI was lower in geriatric than in medical patients \((P < .001\) at all time points). BIdis was lower compared to BIpre in the geriatric and medical groups \((P < .001)\).

In the total study sample, 302 patients (28.8%) had a BIdis lower than their BIpre (i.e., they were discharged with new disabilities from the baseline level of 2 weeks before hospitalization). This decline occurred in 185 geriatric (43.2%) and 117 medical (18.9%) patients \((P < .001)\).

In geriatric units, 252 patients (58.8%) had a BIdis lower than their BIpre (i.e., they worsened in physical function before being hospitalized) as a likely result of the acute disease. The corresponding proportion in medical patients \((212/620, 34.1\%)\) was significantly lower \((P < .001)\).

Functional Trajectories Between Admission and Discharge (During Hospitalization) in Geriatric and Medical Patients

As described above, 464 patients (44.3% of the total population) declined between baseline and admission (252 geriatric and 212 medical patients). In this subpopulation, 274 patients (59%) recovered some function during their hospital stay; of these 274 patients, 114 in geriatric units improved (45.2% of the 252 geriatric patients with preadmission decline), and 160 in medical units improved (75.4% of the 212 medical patients with preadmission decline, \(P < .001\) compared with the rate of improvement in geriatric units). Another 184 patients (39.7%) had unchanged function during hospitalization after the preadmission decline. There were also another 16 patients (3 geriatric and 13 medical patients) who improved their function during hospitalization even though they had not declined before hospitalization.

Only six geriatric and five medical patients declined during hospitalization. In three of the six geriatric patients, the in-hospital decline followed a preadmission decline (1.1% of the 252 geriatric patients with preadmission decline; Figure 2), whereas the other three patients had been stable between baseline and admission. Of the five medical patients with in-hospital decline, three had also declined between baseline and admission (1.4% of the 212 medical patients with preadmission decline; Figure 2), whereas the remaining two had remained stable before admission and
deteriorated only during hospitalization. Figure 2 shows the functional trajectories in the entire population.

In the total group of 464 patients with preadmission decline and the medical subgroup, there were no statistically significant differences in terms of age between persons who did not recover or deteriorated further during hospitalization and those who improved their function \((P = .18)\), but in the geriatric subgroup, the patients who regained function during hospitalization were significantly older than those who remained the same or deteriorated \((84.6 \pm 5.9 \text{ vs } 82.2 \pm 6.9, P = .003)\).

Table 2 shows the results of the logistic regression analysis. A high \(BI_{pre}\) (odds ratio (OR) = 1.03, 95% confidence interval (CI) = 1.02–1.04, per point of \(BI\)), the magnitude of functional decline between baseline and admission \((OR = 0.95, 95\% \text{ CI} = 0.94–0.97, \text{per percentage point of decline in } BI\)), and a short length of stay \((OR = 0.96, 95\% \text{ CI} = 0.93–0.99)\) were significant predictors of the capacity to improve during hospitalization (Table 2).

**DISCUSSION**

To the knowledge of the authors of the current study, this is the first study specifically focused on the capacity to regain function during a hospital stay, which is supposed to be an important determinant of the overall functional outcome of hospitalization. The main findings were that, in nonselected acutely ill older adults, the rate of in-hospital functional recovery after preadmission loss is relevant; the magnitude of the preadmission acute loss, but also a high preadmission level of function, predicts the capacity to recover function during hospitalization; and even though

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Table 1. Characteristics of Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total N = 1,048</th>
<th>Geriatric n = 428</th>
<th>Medicine n = 620</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex, n</strong></td>
<td></td>
<td></td>
<td></td>
<td>.09</td>
</tr>
<tr>
<td>Male</td>
<td>473</td>
<td>180</td>
<td>293</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>575</td>
<td>248</td>
<td>327</td>
<td></td>
</tr>
<tr>
<td><strong>Age, mean ± SD</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>65–74</td>
<td>24.9</td>
<td>15.9</td>
<td>31.1</td>
<td></td>
</tr>
<tr>
<td>75–84</td>
<td>48.0</td>
<td>47.4</td>
<td>48.4</td>
<td>.76</td>
</tr>
<tr>
<td>≥85</td>
<td>27.1</td>
<td>36.7</td>
<td>20.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Widowed, % (N = 939)</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Emergency department</td>
<td>45.1</td>
<td>43.2</td>
<td>46.5</td>
<td>.30</td>
</tr>
<tr>
<td>Other hospital unit</td>
<td>19.6</td>
<td>5.6</td>
<td>29.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Home</td>
<td>33.2</td>
<td>48.1</td>
<td>23.2</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Nursing home</td>
<td>2.1</td>
<td>3.1</td>
<td>0.9</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Barthel Index 2 weeks before hospital admission (baseline), mean ± SD</strong></td>
<td>79.8 ± 25.4</td>
<td>75 ± 27.6</td>
<td>83.2 ± 23.1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Length of stay, days, mean ± SD</strong></td>
<td>10.5 ± 7.4</td>
<td>13.2 ± 8.3</td>
<td>7.8 ± 5.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Number of International Classification of Diseases, Ninth Revision, Clinical Modification, diseases, mean ± SD</strong></td>
<td>3.1 ± 1.7</td>
<td>3.9 ± 1.4</td>
<td>2.5 ± 1.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Dementia, %</strong></td>
<td>5.7</td>
<td>8.8</td>
<td>3.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>First diagnosis, %</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>31.6</td>
<td>24.5</td>
<td>33.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cerebrovascular</td>
<td>10.1</td>
<td>10.0</td>
<td>9.2</td>
<td>.64</td>
</tr>
<tr>
<td>Neurological</td>
<td>4.9</td>
<td>8.9</td>
<td>1.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>15.3</td>
<td>16.1</td>
<td>13.4</td>
<td>.21</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>2.1</td>
<td>1.5</td>
<td>2.4</td>
<td>.24</td>
</tr>
<tr>
<td>Cancer</td>
<td>8.3</td>
<td>4.4</td>
<td>10.2</td>
<td>.001</td>
</tr>
<tr>
<td>Other</td>
<td>27.7</td>
<td>30.8</td>
<td>23.1</td>
<td>.005</td>
</tr>
</tbody>
</table>

SD = standard deviation.
persons hospitalized in geriatric units tend to have worse functional outcomes than medical patients, admission to geriatric wards may not be independently associated with failure to regain function in hospital.

It was found that 59% of people who had experienced preadmission deterioration regained some function during subsequent hospitalization, whereas only approximately 1% worsened. Therefore, although previous studies have emphasized the risk of hospital-related functional deterioration,1,5 the results of the current study suggest that the rate of hospital functional recovery in acutely ill elderly patients may be substantial.

The in-hospital functional outcomes of this population were better than those obtained in most previous investigations. In an observational study, of the patients with preadmission functional decline, only 46% improved in hospital.3 In a randomized controlled trial, 29% of all people improved during their hospital stay, but another 18% declined.6 In two observational studies, only 13% to 20% of all patients improved during hospitalization, and 10% to 17% declined.3,9 The definition of functional improvement used in the current study was a 5-point increase in BI, whereas most previous studies considered recovery from a disabled ADL on the Katz scale, which is a high threshold. This higher sensitivity of the BI may account for the greater rate of in-hospital recovery in the current study. The most significant difference from previous observations was the low rate of in-hospital decline (1% vs 10–20%), and this result was observed even though BI is more sensitive than ADL in detecting small functional deterioration (only a 5-point decrease against the loss of a full ADL). Thus, the better in-hospital functional outcome of the patients in the current study appears to be a true result and confirms data from a recent Italian retrospective study in which the rate of hospital recovery after preadmission loss was 66%.19 The reasons for such recent improved functional outcomes are hard to capture, but the ongoing worldwide diffusion of a “geriatric culture” may have played some role.2

**Table 2. Logistic Regression Analysis of Factors Associated with Improving Function from Admission to Discharge After Preadmission Decline**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Total Population</th>
<th>Geriatric Medicine</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.01 (0.98–1.05)</td>
<td>1.04 (0.99–1.10)</td>
<td>.10</td>
</tr>
<tr>
<td>Male</td>
<td>0.91 (0.57–1.45)</td>
<td>0.95 (0.47–1.94)</td>
<td>.90</td>
</tr>
<tr>
<td>Number of diseases</td>
<td>1.05 (0.89–1.24)</td>
<td>1.12 (0.88–1.43)</td>
<td>.33</td>
</tr>
<tr>
<td>Percentage decline from preadmission to admission BI</td>
<td>0.95 (0.94–0.97)</td>
<td>0.96 (0.94–0.98)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Preadmission BI</td>
<td>1.03 (1.02–1.04)</td>
<td>1.03 (1.01–1.04)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Absence of dementia</td>
<td>1.23 (0.56–2.70)</td>
<td>1.30 (0.45–3.73)</td>
<td>.61</td>
</tr>
<tr>
<td>Admission to geriatrics</td>
<td>0.61 (0.34–1.08)</td>
<td>0.76 (0.12–1.10)</td>
<td>.86</td>
</tr>
<tr>
<td>Admission from emergency department*</td>
<td>2.70 (0.61–11.9)</td>
<td>3.48 (0.36–33.5)</td>
<td>.27</td>
</tr>
<tr>
<td>Admission from other hospital unit*</td>
<td>0.91 (0.19–4.42)</td>
<td>0.89 (0.07–11.2)</td>
<td>.93</td>
</tr>
<tr>
<td>Admission from home*</td>
<td>0.34 (0.07–1.66)</td>
<td>0.26 (0.02–2.66)</td>
<td>.77</td>
</tr>
<tr>
<td>Length of hospital stay</td>
<td>0.96 (0.93–0.99)</td>
<td>0.98 (0.95–1.02)</td>
<td>.55</td>
</tr>
</tbody>
</table>

This analysis was performed in the subpopulation of 464 patients who declined between baseline and admission. The dependent variable was the group of patients who improved in function between admission and discharge (at least a 5-point increase in Barthel Index (BI)). The reference category was the group of patients who remained the same or worsened between admission and discharge.

* The reference category was admission to the hospital from a nursing home.
There was a close association between preadmission functional loss and the capacity to regain function during a subsequent hospital stay, after adjusting for some important confounders such as baseline level of independence. This result was not foreseen, because the magnitude of preadmission functional loss is supposed to be greater in frail people—it was of 59% of geriatric and 34% of medical patients—who theoretically are not expected to improve during their hospital stay and are expected even to decline further. Another feature of patients able to regain function was a high preadmission level of function, probably indicating good premorbid functional reserve. Hence, these findings suggest a “resilient effect” in regaining function that may occur in patients with two seemingly opposite features: a high preadmission level of function and a dramatic functional loss because of the acute illness. In this regard, the hypothesis of a nonlinear relationship between basic performance (e.g., walking) and physiological capacity (muscle strength) should be mentioned. Accordingly, in functionally impaired older people, small gains in muscle strength may produce large effects in increasing performance, whereas even great improvements have little or no effect in persons with normal function. Thus, therapeutic interventions—including administration of drugs, early rehabilitation, hydration, and nutrition—may provide the small increase in muscle strength that will allow frail older adults to improve their functional performance dramatically after the initial loss.

This study also provided novel insight into the differences between geriatric and medical hospitalized patients. Because of its observational nature, this study is not comparable with previous randomized trials that have suggested the superiority of geriatric interventions over those provided in standard medical units. This nonrandomized, “real world” observation, the persons admitted to geriatric units were frailer than medical patients, and this could explain why they had worse functional outcomes than persons hospitalized in medical wards. Nevertheless, admission to geriatric units did not significantly reduce the capacity to recover during the hospital stay after adjustment for possible confounders. This would mean that—even in geriatric units where frail older adults at risk of disability are usually hospitalized—recovery of function is a goal worth pursuing through adequate rehabilitative and therapeutic strategies.

The study has limitations. First, because of missing data, there was a substantial loss of the oldest and most functionally impaired geriatric patients. This bias may account for the result that geriatric patients who improved during hospitalization were older than those who did not, which is in contrast with a previous finding, although even in the medical group, there was no difference in terms of age between patients who recovered during hospitalization and those who failed to recover. Thus, further studies are needed to ascertain whether older age per se affects in-hospital functional trajectories. Second, dementia is known to worsen functional outcomes, and in the current study’s population the ICD9-CM diagnosis of dementia was less frequent than in similar previous studies. This likely underdiagnosis may explain why dementia did not affect the capacity of recovering during hospitalization. Third, the database did not include some important parameters, such as a more-reliable estimate of comorbidity, use of drugs, and laboratory variables, which may contribute to change in functional status during hospitalization.

In conclusion, this study demonstrated that functional recovery during hospitalization is relatively frequent even in geriatric patients, particularly after a large preadmission functional loss and in the presence of a high premorbid level of function. Further research is needed to better identify factors predicting the capacity of hospital functional recovery, as well as therapeutic strategies designed to prevent hospital-related disability.

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The corresponding author has listed all authors of the study and has obtained written consent from other contributors who are not authors and are named in the list above.

Conflict of Interest: There is no conflict of interest to declare.

Author Contributions: Lorenzo Palleschi and Walter De Alfieri: study concept and design, acquisition of data, analysis and interpretation of data, preparation of manuscript. Bernardo Salani, Alberto Marsili, Luigi Di Cioccio, and Stefano Maria Zuccaro: study concept and design, acquisition of data. Filippo Luca Fimognari: analysis and interpretation of data, preparation of manuscript. Andrea Pierantozzi: analysis and interpretation of data.

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