Prevalence of and factors associated with prolonged length of stay in older hospitalized medical patients

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Abstract

Aim

To characterize elderly medical patients and identify factors associated with prolonged length of stay.

Methods

The present prospective observational study evaluated consecutive patients aged ≥65 years admitted in acute geriatric and medical wards. A comprehensive assessment including demographic, clinical, functional and cognitive variables was carried out. Delayed discharge was defined when patients were discharged later than the date they were deemed medically ready for discharge by physicians. The analysis was initially carried out on the total sample and subsequently according to whether hospital admission had been from home, or from intermediate or long-term facilities.

Results

Among 1568 patients (age 81.3 ± 7.3 years, 712 men), we observed a high prevalence of functional dependence, cognitive impairment, chronic immobilization and frailty (50%, 25%, 20% and 40%, respectively). Overall, delayed discharge occurred in 442 cases – resulting in 2637 days of prolonged hospital stay – and was independently associated with impairment in activities of daily living, frailty, high comorbidity and inappropriate admission. Among patients admitted from home (roughly 90% of the sample), delayed discharge occurred in 392 patients, and was independently associated with cognitive impairment, functional dependence, low severity of comorbidity and inappropriate admission (OR 3.39). Among patients admitted from intermediate or long-term facilities, lower cognitive impairment and greater severity of functional dependence were independently associated with prolonged stay.

Conclusions

Poor health conditions and high prevalence of geriatric syndromes are extremely common among older medical inpatients. Delayed discharge was mainly observed in patients admitted from home, and associated with cognitive impairment (OR 1.12) and functional dependence (OR 1.49).

Introduction

Older people become more frequently ill, have a huge burden of chronic diseases and are hospitalized more frequently than younger people.[1-4] Furthermore, they have a longer average length of stay and greater risks of adverse events, as functional decline, in-hospital death and rehospitalization after discharge.[1, 3, 5-7]

We previously showed that the elderly account for a high proportion of multiple hospital admissions. This fact is mainly as a result of poor health conditions, such as high comorbidity, presence of chronic multi-organ diseases and functional dependence.[8] The increased use of hospital resources would therefore seem appropriate, but there are some reports suggesting admission to hospital for social reasons among older patients.[9]

Recent data show an increase in hospital admissions and in patients' age among inpatients in several European Western countries. Furthermore, an increasing length of stay-in has been reported among patients aged over 85 years.[10] There is reason to believe that the progressive aging of Western populations combined with shrinking of in-hospital beds might account for the constant overcrowding of most acute medical wards in Western countries. Hospitals have so far dealt with this situation by reducing patients' length of stay, but this cannot be sustained indefinitely.

Despite the growing number of elderly complex patients posing a relevant burden on hospital acute medical wards, very few studies aimed to comprehensively define the characteristics of these contemporary older medical inpatients, and the variables associated with longer stay in hospital and delayed discharge. These issues are of crucial importance for planning age-specific continuity of care for older patients. In the present study, we prospectively and comprehensively evaluated demographic and clinical variables of contemporary older patients admitted to acute medical wards in several hospitals in order to identify prevalence of and factors associated with prolonged length of stay. Furthermore, in order to reduce potential biases, we stratified analysis according to whether hospital admission had been from home, or from intermediate or long-term facilities.

Methods

The present prospective observational study was carried out on patients aged 65 years and older consecutively admitted to eight acute geriatric and medical wards of two large metropolitan university teaching hospitals (“Azienda Ospedaliera Città della Salute e della Scienza di Torino, Ospedale Molinette” of Turin and “Azienda Ospedaliero-Universitaria San Luigi Gonzaga” of Orbassano) and the hospital “Azienda Ospedaliera S. Croce e Carle” of Cuneo in Piedmont, northern Italy.

The data were collected during the period 1 January 2012 to 30 April 2012 by resident doctors under the supervision of senior specialists of the Division of Geriatrics. The study was carried out

according to the provisions of the Declaration of Helsinki; only consenting patients were included in the study, and signed informed consent was obtained for all of them.

Only patients admitted from the Emergency Department were considered for the study. Patients coming from other hospitals, intensive care units or other departments and those who died or were discharged within 24 h of admission were excluded.

A standardized multidimensional analysis was carried out within 48 h of admission by means of data obtained from medical records and direct interviews (in case of cognitive impairment or lack of collaboration, information was collected from family members or caregivers).

For all patients the following data were recorded: identification, age, sex, marital status, living conditions (whether the patient was living with spouse, alone, with other family members, with a home caregiver or in an institution), date and time of entrance at the Emergency Department, access code and diagnosis made at admission using the ICD-9-CM, number of hospitalizations in the previous 12 months (0, 1–2, >2), number of drugs taken daily, and main blood tests made on admission (serum creatinine, haemoglobin, white blood cells count).

Relevant conditions, such as immobilization and pressure sores, were also recorded. Body mass index was calculated and divided into three classes (underweight if <18.5; normal if 18.5–24.9 and overweight if ≥25).

Standardized scales were used to evaluate functional autonomy, cognitive status, number and severity of diseases, severity of acute critical illness, and frailty.

Functional status was evaluated using activities of daily living (ADL; range 0–6, functional dependence if score ≥2) and instrumental activities of daily living, (IADL; range 0–14, dependence in IADL if score <9), which were translated into Italian.[11, 12]

In not bedridden, participants' functional evaluations were integrated with the execution of the Timed Get-Up and Go (TGUG) test according to the method described by Podsiadlo and Richardson (patients are classified into 4 groups according to the time spent for the test; time >30 s indicates dependency in most ADL and very poor mobility).[13]

Cognitive status was assessed using the Short Portable Mental Status Questionnaire, SPMSQ (cognitive deterioration is considered absent in case of 0–2 errors; mild, moderate or severe if the patient commits 3–4, 5–7 or 8–10 errors, respectively).[14]

Comorbidity was evaluated using the Cumulative Illness Rating Scale (CIRS), which includes a Severity Index (CIRS SI) and a Comorbidity Index (CIRS CI).[15, 16] Severity of acute critical illness was evaluated using the Acute Physiology and Chronic Health Evaluation II score (APACHE II), which is the sum of three scores: age points, chronic health points and acute physiology points (based on the biomarkers at admission).[17]

Frailty was defined according to Fried *et al*. as the presence of three or more of the following conditions: unintentional weight loss (>5 kg/year), weakness (values <30 kg in men and <20 kg in

women, measured by handgrip strength using a SAEHAN® [Saehan Corporation, Masan, South Korea] manual hydraulic hand dynamometer), reported poor endurance or exhaustion, slowness (measured by TGUG) and low levels of activity (estimated inferior to 380 kcal/week for men and inferior to 270 kcal/week for women).[18-20] Sarcopenia was assessed evaluating the presence of weakness (detected as described above).

ADL, TGUG and SPMSQ were measured again in all survivors at discharge. Using standardized forms, the ward care physician was asked some specific questions on: (i) appropriateness of hospitalization (which was defined not appropriate when patients did not necessitate of hospital-provided diagnostic or therapeutic procedures and would have benefited more from different settings of care); (ii) date at which the patient was deemed clinically steady and dischargeable from an acute ward (according to Delayed Discharges Definitions of National Services of Scotland of 1 May 2012);[21] (iii) personal opinion on the best setting of discharge (home, post-acute or intermediate care, hospice, home hospitalization service, nursing home or long term facility, other); and (iv) the main reason accounting for the eventual prolonged hospital stay (medical reasons, impossibility or unwillingness of proxies to take care of the patient at home, waiting for placement in intermediate or long term care facilities).

A delayed discharge or prolonged length of stay was defined when effective discharge occurred one or more days later than the date the physician in charge deemed each patient medically ready for discharge, according to the criteria mentioned above (Delayed Discharges Definitions of National Services of Scotland of 1st May 2012).[21] The date in which a patient was deemed ready for discharge was decided as a part of a multidisciplinary process and focused on the needs of the individual patient. The prolonged stay-in was calculated as the period between the date a patient had been judged clinically ready for discharge and the date he/she was discharged.[22]

Date and setting of discharge, vital status, and principal and secondary diagnosis at discharge (according to the ICD-9-CM) were also recorded and considered for analysis.

The data, collected on preprinted standardized protocols and subsequently transferred to MS Excel (Microsoft, Redmond, WA, USA), were analyzed using SPSS/PC+ (SPSS Inc, Chicago, IL, USA). A preliminary explorative analysis was carried out on continuous variables (skewness and kurtosis). The frequency of dichotomic and categorical variables was calculated, as well as the average and the standard deviation (SD) of continuous variables. Univariate analysis (χ^2-test for dichotomic and categorical variables, ANOVA, and Mann–Whitney test for continuous variables with and without normal distribution, respectively) was used to identify factors associated with prolonged length of stay. Variables significantly associated at the univariate analysis were then introduced in a multivariate stepwise forward logistic model to identify independently associated variables. The cut-off for statistical significance was $P < 0.05$. The analysis was initially carried out on the total sample of patients and in a second step in patients stratified according to whether hospital admission had been from home, or from intermediate or long-term facilities.

Results

A total of 1771 participants were evaluated. Complete data were available for 1568 patients (mean age 81.3 ± 7.3 years, 712 men) who were included in the study.

Table 1 reports the main characteristics of the study sample. More than half of the patients were dependent in daily activities, and roughly one of four had moderate or severe cognitive impairment. Less than one of five of the participants were completely normal in functional mobility (time taken to carry out TGUG test <10 s), roughly 20% were bedridden, 40% were frail and 7% had pressure sores. Most patients were of normal weight (48.2%), followed by underweight (28.9%) and overweight-obese (22.9%).

Table 1. Main characteristics of the total sample of patients

Mean age (years)	81.3 ± 7.3
Men, *n* (%)	712 (45.4)
Living with spouse, *n* (%)	677 (45.3)
No. hospitalizations in the past year	
0	747 (50.8)
1–2	614 (41.7)
>2	93 (6.3)
Frailty, *n* (%)	649 (41.4)
Patients admitted from home, *n* (%)	1353 (86.3)
Bedridden, *n* (%)	323 (20.7)
Patients with pressure sores, *n* (%)	110 (7.0)
Mean ADL at entry	2.3 ± 2.2
Functional dependence (ADL ≥2) at entry, *n* (%)	838 (53.7)
TGUG test <10 at entry, *n* (%)	215 (17.6)
TGUG test >30 at entry, *n* (%)	412 (26.3)
Mean IADL at entry	6.5 ± 4.9
Instrumental functional dependence (IADL <9) at entry, *N* (%)	996 (63.8)
Mean SPMSQ at entry	3.1 ± 2.9
Moderate-severe cognitive impairment (SPMSQ > 4) at entry, *n* (%)	385 (27.2)
Mean no. drugs taken daily	6.6 ± 3.4
Mean CIRS CI	2.8 ± 1.6
Median CIRS SI (25th–75th percentile)	1.76 (1.5–2.2)
Median APACHE II score (25th–75th percentile)	10 (8–13)
BMI <18.5, *n* (%)	452 (28.9)
BMI >24.9, *n* (%)	359 (22.9)
Mean hemoglobin (g/dL)	11.9 ± 2.3
Median serum creatinine (mg/dL; 25th–75th percentile)	1.04 (0.79–1.48)
WBC count (cells × 10^3/mL), median (25th–75th percentile)	11.47 (7.97–15.7)
Not appropriate admission, *n* (%)	134 (8.6)
In-hospital death, *n* (%)	165 (10.5)
Delayed discharge, *n* (%)	442 (31.5)
Median length of stay, days (25th–75th percentile)	11 (7–16)

ADL, activities of daily living scale; APACHE II, Acute Physiology and Chronic Health Evaluation II score; BMI, body mass index; CIRS CI, Cumulative Illness Rating Scale, Comorbidity Index; CIRS SI, Cumulative Illness Rating Scale, Severity Index; IADL, instrumental activities of daily living scale; SD, standard deviation; SPMSQ, Short Portable Mental Status Questionnaire; TGUG, Timed Get-Up and Go test; WBC, white blood cells.

The main causes of hospital admission were cardiovascular (29.1%) and respiratory (24.8%) diseases, followed by gastrointestinal (10.0%), onco-hematological (9.9%) and neurological (8.6%) disorders. A total of 1353 patients (86.3%) were living at home before hospital admission (of these, 24.2% were living alone and 13.2% were living with a caregiver) while 215 (13.7%) came from long-term or intermediate care facilities. A total of 93 patients (6.3%) had been admitted to hospital three or more times in the previous year, and the mean number of drugs taken daily was 6.6.

A total of 165 patients died during hospital stay (10.5%). Among 1403 survivors, the mean length of stay-in was 11 days; 442 patients (31.5%) had a prolonged length of stay not determined by clinical reasons, resulting in 2637 days of prolonged hospital stay. In the overall sample, 8.6% of hospital admissions were deemed not appropriate by the ward care physician.

In the overall sample, several demographic (living alone or with caregiver, number of hospital admissions in the previous year), functional (dependence in daily activities and high ADL scores, dependence in instrumental activities) and clinical variables (severity of cognitive impairment, CIRS CI, CIRS SI, chronic immobilization, frailty, APACHE II score, low body mass index, discharge in rehabilitative or long term facilities) were found to be associated with prolonged stay at univariate analysis. After multivariate analysis, frailty (OR 1.49) and functional dependence (OR 1.57), high ADL score at discharge (OR 1.13) and high comorbidity (OR 1.21), as well as the opinion of not appropriate admission (OR 3.51), were found to be independently associated with prolonged stay.

The prevalence of delayed discharge was 32.1% in patients living at home before hospitalization and 27.6% in patients coming from long-term or intermediate care facilities. The former group accounted for 88.7% of cases of prolonged stay. Patients belonging to the second group were older, had worse functional and cognitive performances, higher severity of comorbidity and greater prevalence of frailty, chronic immobilization, and pressure sores than those living at home before hospitalization. Among patients living at home before admission, 854 were deemed dischargeable at home by the caring physician, but just 824 could be discharged at home. Overall, however, there was a fairly good concordance between the physician's opinion on the best setting of discharge and the setting of discharge effectively carried out in both groups of patients (Table 2).

Table 2. Main descriptive characteristics of patients admitted to hospital from home and from intermediate or long-term care facilities

	Patients admitted from home	**Patients admitted from intermediate or long-term care facilities**
	1353 (86.3%)	**215 (13.7%)**
Mean age (years)	80.9 ± 7.2	84.3 ± 7.3
Men, *n* (%)	626 (46.3)	86 (40.0)
Frailty, *n* (%)	524 (38.7)	125 (58.1)
Bedridden, *n* (%)	223 (16.5)	100 (46.7)
Patients with pressure sores, *n* (%)	71 (5.2)	39 (18.1)
Functional dependent (ADL ≥2) at entry, *n* (%)	663 (49.0)	175 (81.4)
Mean SPMSQ at entry	2.9 ± 2.8	4.8 ± 3.0
Mean no. drugs taken daily at entry	6.5 ± 3.3	7.6 ± 3.6
Mean CIRS CI	2.9 ± 1.6	2.6 ± 1.6
Median CIRS SI (25th–75th percentile)	1.7 (1.5–2.1)	2.0 (1.5–3.0)
Median APACHE II score (25th–75th percentile)	10.0 (8.0–13.0)	12.0 (9.0–16.5)
Mean hemoglobin (g/dL)	11.9 ± 2.3	11.9 ± 2.2
Mean serum creatinine (mg/dL)	1.3 ± 0.8	1.4 ± 1.1
Median WBC count, cells × 10^3/mL (25th–75th percentile)	11.09 (7.83–15.08)	14.36 (10.75–18.33)
Not appropriate admission, *n* (%)	106 (7.8)	28 (13.0)
Physician opinion about the best setting of discharge, *n* (%)		
Home	854 (69.9)	29 (16.0)
Post-acute care	145 (11.9)	21 (11.6)
Nursing home	70 (5.7)	118 (65.1)
Rehabilitation	64 (5.2)	9 (5.0)
Home assisted discharge	47 (3.8)	1 (0.6)
Hospice	21 (1.7)	–
Home hospitalization service	10 (0.8)	–
Other	11 (0.9)	3 (1.7)
Setting of discharge, *n* (%)		
Home	824 (60.9)	30 (14.0)
Post-acute care	192 (14.4)	27 (12.6)
Rehabilitation	69 (5.3)	9 (3.7)
Nursing home	59 (4.6)	112 (52.1)
Home assisted discharge	42 (3.2)	–
Home hospitalization service	12 (0.9)	–
Hospice	4 (0.3)	1 (0.5)
Other	8 (0.6)	3 (1.4)
Deceased, *n* (%)	131 (9.7)	34 (15.8)
Delayed discharge, *n* (%)	392/1222 (32.1%)	50/181 (27.6%)

ADL, activities of daily living scale; APACHE II, Acute Physiology and Chronic Health Evaluation II score; CIRS CI, Cumulative Illness Rating Scale, Comorbidity Index; CIRS SI, Cumulative Illness Rating Scale, Severity Index; SD, standard deviation; SPMSQ, Short Portable Mental Status Questionnaire; WBC, white blood cells.

Most of the main demographic, functional and clinical variables investigated were found to be associated with prolonged length of stay in both groups of patients. After multivariate analysis

greater cognitive impairment (OR 1.12) and functional limitation in mobility (OR 1.49), lower severity of comorbidity (CIRS SI: OR 0.81) and the physician's opinion of not appropriate admission (OR 3.39) were independently associated with prolonged length of stay among patients admitted to hospital from home. Among patients admitted to hospital from intermediate or long-term care facilities, lower cognitive impairment (SPMSQ: OR 0.59) and greater severity of functional dependence (OR 2.43) were independently associated with prolonged stay (Table 3).

Table 3. Odds ratio from logistic regression model. Variable associated with prolonged length of stay

Variable	Total sample of patients	Patients coming from home	Patients coming from long-term or intermediate care facilities
	1403 (100%)	**1222 (87.1%)**	**181 (12.9%)**
	OR (CI 95%)	**OR (CI 95%)**	**OR (CI 95%)**
Frailty	1.49 (1.08–2.06)	–	–
CIRS CI	1.21 (1.11–1.31)	–	–
Functional dependence (ADL ≥ 2) at entry	1.57 (1.03–2.39)	–	–
ADL at discharge	1.13 (1.02–1.25)	–	–
Not appropriate admission	3.51 (2.22–5.54)	3.39 (1.88–6.11)	–
SPMSQ at entry	–	1.12 (1.05–1.19)	0.59 (0.39–0.88)
TGUG at entry	–	1.49 (1.26–1.77)	2.43 (1.00–5.86)
CIRS SI	–	0.81 (0.68–0.95)	–

ADL, activities of daily living scale; CI, confidence interval; CIRS CI, Cumulative Illness Rating Scale, Comorbidity Index; CIRS SI, Cumulative Illness Rating Scale, Severity Index; OR, odds ratio; SPMSQ, Short Portable Mental Status Questionnaire; TGUG, Timed Get-Up and Go test.

Discussion

In a sample of more than 1500 elderly patients hospitalized in Piedmont, Italy, we observed very poor health conditions. and a high prevalence of functional disability, cognitive impairment, frailty and chronic immobilization (roughly 50%, 25%, 40% and 20%, respectively). Furthermore, in a remarkable proportion of patients, two or more of these conditions were coexisting. A prolonged length of stay was observed in 442 cases (31.5%), leading to 2637 days of prolonged hospital stay during the period of observation. In the overall sample, functional dependence, frailty and high comorbidity were independently associated with prolonged stay.

Nearly 90% of delayed discharges occurred among patients living at home before hospitalization. In this group, a prolonged length of stay-in was mainly associated with greater severity of cognitive impairment and functional dependence (measured by TGUG test), despite lower comorbidity

burden. These patients are mainly represented by older, demented, functionally dependent patients, who can no longer be managed at home by proxies or carers. Increasing the availability and the economic affordability of home-care services, as well as greater and earlier availability of beds in long-term facilities, might therefore have the potential to reduce this burden of prolonged length of stay in hospital.

The variable "admission deemed not appropriate" was associated with delayed discharge both in the overall sample and in patients coming from home. Although the appropriateness of hospital admissions, particularly in elderly people, has been extensively investigated and standardized tools have been proposed for clinical use, they are likely poorly implemented in the current clinical practice, at least in our region.[23-26] It appears likely that these inappropriate admissions reflect the absence of immediately available alternative settings of chronic care for these older ill patients.

In keeping with previous studies, the present results show that cognitive and physical impairment are well recognized risk factors for discharge delays and longer hospital stay.[22, 27-30]

Our findings might have some clinical implications in designing models of care for older vulnerable patients and highlight the urgency to implement models of continuity of care for these patients in order to reduce the unnecessary recourse to hospital services. As care for older demented patients should include either short-term acute hospital stay or long-term nursing home care as required, the present findings suggest that the availability of preferential or "fast" admission procedures to nursing homes from emergency departments or acute internal wards for these patients without acute severe comorbidity might consistently reduce the burden of prolonged and unnecessary hospitalization. Furthermore, older people are most likely to experience poor quality of care as a result of the pressure on hospitals. Being perceived as the "wrong patient in the wrong place" has been shown to reduce the quality of care, building attitudes of resentment among nursing and medical staff.[8]

In our view, the main strength of the present study was the large multicentre cohort of unselected patients consecutively admitted in internal medical wards of secondary and tertiary hospitals of our region. The sample of patients could be considered representative of contemporary older medical inpatients as regard to the clinical, cognitive and functional characteristics. We believe that these results can be generalized to older hospitalized patients in other regions of Italy, as well as in several other Western countries. In contrast, our findings regarding prolonged stay are influenced by the local availability and organization of intermediate and long-term care facilities, and should be more carefully extended to different geographic areas, even within Italy. However, in our view, this limitation does not diminish the external validity of the results of the present study, which was primarily addressed to identify the conditions associated with prolonged stay, and not to evaluate the burden of days of unnecessary hospitalization, the latter being more dependent on the local organization of post-acute and long-term care in countries covered by a National Health System.

In conclusion, the present study has shown the dramatically high prevalence of major geriatric syndromes (functional dependence, cognitive impairment, frailty and chronic immobilization) among contemporary older medical inpatients. A prolonged length of stay not determined by clinical reasons occurred in roughly one-third of patients, mainly accounting for older demented patients with low comorbidity but severe functional impairment who could not longer be managed at home by proxies or caregivers. In the context of continuity of care for older vulnerable patients, fast admission to and implementation of long-term facilities might have the potential to consistently reduce the burden posed by these patients on hospital acute wards.

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Disclosure statement

The authors declare no conflict of interest.

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