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Abstract

Background: All over Europe, an increased use of public health services has been noticed, particularly referring to access and hospitalization among elderly in the emergency department (ED). Methods: Prospective study at a university teaching hospital in Turin, northern Italy, recruiting subjects aged >65 years consecutively attending the medical ED during 1 month. Demography, functional and cognitive status, comorbidity, severity of acute critical illness, previous ED accesses and hospitalization, diagnosis and other relevant data for ED admission and hospitalization were considered. Results: Data were collected for 1632 patients (average age 77.6 years), 89% of the 1834 older subjects who attended the ED during the study period (29.3% of the patients attending the ED). Six hundred and fifty older subjects were admitted to the hospital (62.2% of the hospital admissions). Severity of acute critical illness, presence of chronic obstructive pulmonary disease and heart failure, a high number of drugs being taken, functional dependence and advanced age were independently associated with hospital admission. One-third of the patients appeared to be frequent users of health services with more than two visits/admissions. Higher comorbidity, partial or complete functional dependence, chronic diseases (arrhythmia, pulmonary neoplasm, diseases of the large intestine) and politherapy were associated either with frequent use of the ED and multiple admissions. Conclusions: Elderly account for a high proportion of hospitalizations, mainly determined by critical health conditions, advanced age and functional dependence. Poor health conditions (high comorbidity and presence of chronic multi-organ diseases), functional dependence but not critical social factors were the main determinants of multiple hospital admissions.

Introduction

In Italy and in the majority of the Western countries, the elderly constitute ~20% of the population1 and they represent a group that is in constant and rapid growth, particularly in the older age range. Among elderly individuals, numerous, complex clinical problems combined with a high frequency of critical social factors and a lack of assistance lead to increased use of public health services. In particular, access to the emergency department (ED) and hospitalization contribute notably to the consumption of health resources on the part of the elderly. The percentage of patients attending the ED who are elderly is estimated at

~20% of the total,2–6 despite the widely held belief that this figure is greater.3 However, the elderly are more frequently ill and with greater severity, they require more exams and are hospitalized more often than the non-elderly.2–4,6,7 Moreover, the elderly have a greater level of urgency, longer average length of stay and greater risk of adverse events after discharge, as functional decline, readmission to the ED, hospitalization and death.2,3,6,8–10 Although the increased use of hospital resources would therefore seem appropriate, there are some reports of elderly patients attending hospitals for social reasons who are frequently admitted.5 The main factors which have been reported to be associated with an increased use of EDs or hospitals include the following: very old age, male gender, low levels of education, widowhood, living alone, previous use of EDs or hospitals and functional impairment.7 Recent data indicate an increase in hospital admissions in several European western countries1 and there is reason to believe that the progressive ageing of western populations might, at least in part, account for the constant rise in use and the chronic overcrowding of EDs and hospital wards. However, very few studies have tried to comprehensively define the characteristics and the patterns of use of EDs and hospitals by the elderly. In particular, it seems important to evaluate whether and to what extent among older subjects age-specific social factors may contribute beyond clinical reasons to ED access and/or to subsequent hospitalization. In our opinion, this issue is of crucial importance for planning age specific suitable out-of-hospital settings of care. Therefore, in this study, the principle demographical, social, clinical and functional characteristics of subjects aged >65 years attending a large metropolitan ED have been systematically evaluated in order to identify the conditions associated with access to the ED and the determinants of the admission in the case of elderly patients.

Methods

This study was conducted in a large metropolitan hospital, the Azienda Ospedaliera Universitaria San Giovanni Battista in Turin, over the course of 1 month (September 2008) on all patients of both sexes aged >65 years, consecutively attending the medical ED. Signed informed consent was obtained for all participants and the study was conducted according to the Recommendations Guiding Physicians in Biomedical Research Involving Human Subjects. A standardized, multi-dimensional analysis was carried out on all of the patients using interview results integrated with information collected from family members or caregivers in the case of patients with cognitive impairment or those incapable of collaboration. The data were collected by five resident doctors from the section of Geriatrics under the supervision of a senior specialist in geriatrics, by means of direct interviews and using standardized evaluation protocols. For all patients, the following information was recorded: name and surname, age (divided into three groups: 66–74, 75–84, ≥85 years), sex, level of education (illiterate, primary, lower secondary, higher secondary and university), marital status, living conditions (whether patient lives with spouse, alone, with other family members, with home caregiver or in an institution), presence of in-home medical assistance, and, for patients living at home, the level of isolation graded as follows: daily presence/support by family members or carers, occasional (at least once a week) presence/support by family members or carers and rare/none (less than once a week) presence/support by family members or carers.

The data concerning access to the ED include the date and time of entrance, the access code (white, green, yellow and red, according to increasing severity and urgency at admission), the means of access (own

vehicle, private ambulance and emergency ambulance), whether the patient was seen by his/her general practitioner (GP) prior to arrival in the ED, the number of prior visits to the ED and the number of admissions in the previous 12 months (0, 1, 2–3, 4–6, ≥7), and lastly the reason for the admission to the ED. The diagnosis made during admission is reported using the ICD-9-CM system, subsequently classified according to which principal group of pathologies the patient belongs to. The clinical history was taken from the documentation produced by the patient upon arrival in the ED. Relevant conditions (as dementia and/or immobilization) were noted.

Standardized scales of classification were used for the evaluation of functional autonomy, cognitive status and severity of critical illness. Functional status was classified according to the activities of daily living (ADL)11 and instrumental activities of daily living (IADL)12 scales in reference to the subject's condition before admission: the ADL is a scale that measures six functions relating to activities necessary for self-care, in each of which the patients can be described as autonomous or dependent; the IADL is a scale that measures autonomy in activities non-fundamental for personal care, but which allow the subject to live independently in a community. Cognitive status was evaluated using the Short Portable Mental Status Questionnaire (SPMSQ),13 a questionnaire of 10 questions to judge an individual's orientation, memory and concentration: we classified deterioration as either absent, mild, moderate or severe according to the number of errors made by the patient. Information was obtained where possible by direct interviews with the patient, and was integrated with information from close family members or caregivers. Comorbidity was evaluated using the Charlson Index (CI),14 which is currently used for the evaluation of active diseases in several geriatric settings; it groups main pathologies into four classes ranked from one to six expressing level of severity. Severity of acute critical illness was evaluated using APACHE II score,15 which is the sum of three scores: age points, chronic health points and acute physiology score points (based on the biomarkers at the moment of admission). The correction coefficient according to illness, which was drawn from the list of coefficients published in the original Knaus et al. Paper,15 was applied to the main diagnosis upon hospitalization.

Lastly, an evaluation was made on the decision to admit or to dismiss the patient, the duration of stay in the ED (measured in hours) and the outcome of the admission (dismissed, deceased, transferred to a nursing home and transferred to another structure). This information was, respectively, obtained from the ED notes and from dismissal letters. Furthermore, a judgement was expressed of the main reason for the admission (diagnostic, therapeutic, diagnostic–therapeutic, humanitarian, social or dictated by lack of alternatives in intermediate structures).

Statistical methodology

The data were collected on preprinted paper forms and subsequently transferred to computer. The data were analysed using SPSS/PC+. The frequency of dichotomic and categorical variables was calculated, as well as the average and the standard deviation (SD) of continuous variables. No continuous variable was found to be not normally distributed. Univariate analysis was conducted on the characteristics of the population. The chi-square test was used to analyse dichotomic and categorical variables and variance analysis was used for continuous variables, because of the high number of subjects studied. Variables

significantly associated using the sets of univariate analysis were then introduced in a multivariate stepwise forward logistic model to identify independently associated variables. The cut-off for statistical significance was $P < 0.05$.

Results

In the period of the study, data were collected for 1632 patients aged >65 years, 89% of a total of 1834 subjects within the age range who attended the ED. Older subjects represented 29.3% of the total number of patients attending the ED during the study period. Table 1 shows the main characteristics of the sample group. The average age of the sample group is 77.6 ± 7.5 and roughly a fifth of the patients belonged to the oldest age group (≥85 years). Almost a quarter of the patients lived alone, and more than a third were not independent in daily activities (36.6% on ADL and 37.5% on IADL) or had cognitive impairment. Almost half of the patients (47.4%) had significant comorbidity with a CI of ≥2. More than half (58.5%) came to the ED with their own transport, but only 30% reported to have been visited by his/her GP prior to coming to the ED. As a whole, 650 older patients (39.8% of the study sample) were admitted, mostly directed to the internal medicine or geriatrics wards. Older patients accounted for 62.2% of the hospital admissions during the study period. The principal causes for hospital admission were found to be diseases of the circulatory system (30.9%), non-otherwise specified signs and symptoms (28.9%) and diseases of the respiratory system (9.2%). Table 2 shows the factors independently associated with hospitalization: in addition to the triage code and referral by a GP, the following variables were found to be independently associated with the decision to admit the patient: an elevated APACHE II score, the presence of COPD and heart failure, a high number of drugs being taken, functional dependence (ADL) and advanced age.

Table 1
Principal characteristics of the sample

Characteristics	Number of subjects (%)
Age (mean ± SD), years	77.6 ± 7.5
66–74	613 (37.6)
75–84	710 (43.5)
≥85	309 (18.9)
Female	886 (54)
Number of prescribed drugs (mean ± SD)	4.8 ± 2.9
Marital status	
Married	916 (56.1)
Widowed	640 (39.2)
Not married	76 (4.7)
Lives with	
Spouse	857 (52.5)
With other family member	247 (15.2)
Alone	402 (24.6)
Nurse at home	82 (5)
Institution	44 (2.7)
Social/family support	
Rare/none	136 (8.3)

Characteristics	Number of subjects (%)
Presence of in-home medical assistance	156 (9.5)
Immobilization	396 (12.1)
Education	
Illiterate	153 (9.4)
Primary	884 (54.1)
Lower secondary	350 (21.5)
Higher secondary	196 (12)
University	49 (3)
Access code	
White	78 (4.8)
Green	1102 (67.5)
Yellow	416 (25.5)
Red	36 (2.2)
Means of access	
Own transport	959 (58.8)
Emergency transport	533 (32.7)
Private ambulance	140 (8.5)
Prior visit to GP	513 (31.4)
Prior visits to the ED during the last year	
0–1	1138 (69.7)
2–3	338 (20.7)
4–6	126 (7.7)
≥7	30 (1.9)
Admissions during the last year	
0–1	1297 (79.5)
2–3	247 (15.1)
4–6	68 (4.2)
≥7	20 (1.2)
Dependent (ADL ≥ 1)	598 (36.6)
Dependent (IADL < 10)	612 (37.5)
SPMSQ	
Low–mild cognitive impairment	438 (26.8)
Severe cognitive impairment	163 (10)
CI ≥ 2	774 (47.4)
APACHE II (mean ± SD)	9.18 ± 3.43
ED decision	
Dismissal	982 (60.2)
Admission	650 (39.8)
Internal medicine/geriatrics	479 (73.6)
Surgery	27 (4.2)
Emergency medicine/ICU	16 (2.5)
Other specialties	98 (15)
Hospital at home	27 (4.2)
Others	3 (0.5)
Outcome/discharge	
At home	519 (79.9)
To institution	31 (4.8)
Deceased	54 (8.3)
Home under medical care	46 (7)
Reason for the admission	

Characteristics	Number of subjects (%)
Diagnostic	117 (18)
Therapeutic	310 (47.7)
Diagnostic–therapeutic	170 (26.2)
Humanitarian	23 (3.5)
Not indicated/social	24 (3.7)
Not indicated/lack of alternatives in intermediate structures	6 (0.9)

- APACHE, acute physiology and chronic health evaluation; ICU, intensive care unit

Table 2
Conditions independently associated with hospital admission

	β	SE (β)	OR	*P*-value
Access code	0.174	0.066	1.189	0.009
Visited by GP	0.566	0.151	1.7625	<0.001
Number of prescribed drugs	0.052	0.024	0.949	0.032
Age	0.032	0.009	0.967	<0.001
ADL	0.198	0.052	0.819	<0.001
APACHE II	0.092	0.225	0.911	<0.001
COPD	0.707	0.267	0.493	0.008
Heart failure	1.042	0.489	0.353	0.033

- APACHE, acute physiology and chronic health evaluation; COPD, chronic obstructive pulmonary disease

More than two-thirds of the examined population seek hospital treatment only occasionally (not more than once a year), while one-third of the patients appear to be frequent users of health services with more than two visits per admissions. In fact, during the previous year, >30% of the patients used the ED two times or more and 20.1% were admitted two or more times. In particular, 156 patients (9.6%) accessed the ED four or more times and 88 patients (5.4%) were admitted four or more times. Higher comorbidity, a condition of partial or complete dependence, the presence of chronic diseases (arrhythmia, pulmonary neoplasm, diseases of the large intestine) and politherapy were associated either with frequent use of the ED and multiple admissions (tables 3 and 4). During the study period, 53 admissions (8.1%) appeared not to be justified by urgent diagnostic–therapeutic reasons, but by humanitarian reasons or by a lack of alternatives in intermediate structures.

Table 3
Conditions independently associated with a frequent use of the emergency department

	β	SE (β)	OR	*P*-value
Level of education	−0.153	0.074	0.857	0.037
Arrhythmia	0.499	0.151	1.647	0.001
Pulmonary neoplasm	0.909	0.445	2.482	0.041
ADL	−0.435	0.083	0.647	<0.001
Number of prescribed drugs	0.136	0.023	1.145	<0.001
CI	0.122	0.033	1.130	<0.001

Table 4
Conditions independently associated with repeated hospitalization

	β	SE (β)	OR	*P*-value
Arrhythmia	0.425	0.167	1.530	0.011
Bowel diseases	0.955	0.458	2.600	0.037
ADL	−0.380	0.093	0.683	<0.001
Number of prescribed drugs	0.125	0.026	1.133	<0.001
CI	0.133	0.043	1.143	0.002

Discussion

In this study, we comprehensively evaluated the main demographical, social, clinical and functional characteristics of the subjects aged >65 years who seek hospital treatment. Our results show that the elderly account for a high proportion of those using the ED (29.3%) and an even higher proportion of hospitalizations (62.9%), mainly because the rate of hospitalization of patients in this age group is rather high (39.8%), in accordance with previous studies (2,3). The results also demonstrate that the main determinants for hospitalization of older subjects are critical health conditions (the presence of diseases like heart failure and COPD as well as a higher severity of critical illness), although advanced age and functional dependence were also associated with admission.

Moreover, the results of this study allow us to identify at least two different subsets of older patients within the sample studied: while nearly 70% of the patients reported to use the ED occasionally (not more than once a year), the remaining 30% accessed the ED two or more times during the last year; while slightly <80% of the patients were admitted once or less in the previous year, 15% of the patients were admitted two or three times and 5% four or more times in the same period. Among this group of patients who contribute the greater part of the visits to the ED and hospitalizations (‘revolving door patients’), we observed a clear overlapping of the conditions associated with repetitive use of the ED and hospitalization, mostly representative of poor health conditions (high comorbidity and presence of chronic multi-organ diseases, high number of pharmaceuticals being taken).

Although, we have observed a high prevalence of important critical socio-demographic factors and of functional and cognitive limitations in this sample of elderly patients, only the condition of functional dependence was found to be among the principal determinants of the admission.

Although, 53 admissions during the study period appeared to be poorly justified on mere clinical basis, critical social factors (such as living alone, widowhood, lack of social/family support, immobilization), were not independently associated with a frequent recourse to hospital, which is in contrast with reports from some previous studies.2,7–9,16–18 Several factors might account for these apparently contrasting findings: age-, social- and ethnic differences in characteristics of the samples studied, different settings (metropolitan, rural) of patients recruitment, the hospital setting considered for this study (tertiary referral university teaching hospital), differences in the social–health local network for frail elderly patients, might

have contributed to weaken the impact of social factors on the recourse to hospital. Moreover, in our view, it is likely that a careful evaluation of functional and cognitive limitations may substantially reduce the impact of mere social factors on hospital admission.

On the whole, the results of the present study seem to suggest that increased access to hospital treatment and the current problems of overcrowding in medical wards and EDs could mostly be attributed to polypathology and clinical problems associated with loss of functional autonomy which are found in a limited but not insignificant percentage of elderly subjects. Therefore, strategies designed to identify specific post-hospital treatment settings for these patients could have a favourable impact on hospital flows. In particular, admission to intermediate structures of variable intensity of treatment for patients with functional dependence and an efficient network of ongoing integrated medical surveillance outside the hospital (as the Hospital at Home model) for patients that stay at home could very likely help to reduce patient flows entering EDs. Despite the use of post-acute care structures is in constant growth,19 the benefits in terms of medium to long-term survival are yet to be defined. More studies are, therefore, required to understand the real cost–benefit ratio of the use of these structures.

Some limitations of this study should be addressed. The examined population consists of elderly patients attending the ED of one university teaching hospital in a big city of Northern Italy and could not be comparable with patients attending other hospitals. First of all, the opportunity for access to the ED and hospitalization could be substantially different in other countries with different health policies. Furthermore, different strategies in the management of the EDs in other contexts could also modify the percentage and the determinants of admissions. Nevertheless, the number of admissions in the present study is in accordance with previous studies, which reported percentages between 30% and 50%.2,3 The clinical–demographical elements associated with admission in our study seem to be consistent with sporadic evidence in literature.2,3,7 Despite the mono-centric design of the study, the number of patients examined and the rate of inclusion in the study of patients using the ED are higher than other studies.20–22 We were not able to evaluate and include in the study subjects that requested emergency transportation but were not transported to the ED; this enlistment bias could make the population that requested emergency transportation seem ‘more ill’ than is actually the case. Furthermore, existing data indicate that 5% of the elderly patients refuse the transport to the ED after having called for it.23 Finally, it is not to be excluded that the high recourse to hospital treatment in a limited number of patients could be partly attributable to the fact that they received a less accurate diagnosis and were dismissed with unrecognized pathologies or ‘undertreated’, as suggested by previous studies.21

Against these limitations this study represents, to our knowledge, one of the first attempts to define the principal characteristics associated with the frequent use of hospitals, through comprehensive evaluation of social and clinical problems in elderly patients, mostly using standardized scales and methodologies.

The clinical implications of our results have the most relevance to the organization of services and health resources for elderly patients and indicate the need to define appropriate care settings to reduce the incidence of recourse to hospitalization in the group of patients characterized by comorbidity and

functional dependence. Both post-hospital admission to medium intensity care facilities and the possibility of prolonged care at home under the care of Hospital at Home service24–26 could be effective and economically advantageous in this sense.

In conclusion, the results of our study demonstrate that the elderly represent a significant percentage of patients attending the ED and an even higher percentage of hospital admissions. Despite most of the older patients use occasionally ED and hospital care, rough one-quarter of them was observed to have recurrent admissions during the year. Multiple severe pathologies associated with conditions of reduced functional autonomy seem to be the main determinants of the frequent hospital admissions in these patients. Although the results of the study need to be confirmed in other settings of care, the identification of these problems could stimulate further research into the development of alternative appropriate care settings for these patients to reduce the incidence of recourse to hospital treatment.

Conflicts of interest: None declared.

Key points

‘Revolving door patients’ are great users of public health resources.

Increased access to hospital treatment and the current problems of overcrowding in medical wards and EDs could mostly be attributed to polypathology and clinical problems associated with loss of functional autonomy.

There is a clear need to define appropriate care settings to reduce the incidence of recourse to hospitalization in the group of patients characterized by comorbidity and functional dependence.

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