BRIEF NOTES

Referral patterns in elderly emergency department visits

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Abstract

Objective. To assess elderly individuals' demand for emergency department (ED) care, in terms of the characteristics, processes, outcomes, costs by referral pattern.
Data source. All ED visits involving patients aged 65 and older, extracted from the 2010 dataset of an Local Health Agency, in North-Eastern Italy (no. = 18 648).
Study design. Retrospective cohort study.
Principal findings. Patients were referred by primary care professionals (PCPs) in 43.1% of cases, 1.4% came from nursing homes (NH), and 55.5% were self-referred (SR). The SR group had a higher adjusted odds ratio (aOR) for non-urgent conditions (1.98 CI 1.85-2.12), but a lower aOR for conditions amenable to ambulatory care (0.53 CI 0.48-0.59), and a lower consumption of resources. The SR group tend to occur more frequently out of hours, and to coincide with a shorter stay at the ED, lower observation unit activation rates, lower hospitalization rates and a lower consumption of services than other two groups. The average costs for all procedures were lower for the SR patients (mean = 106.04 € ± SD 84.90 €) than for those referred by PCPs (mean = 138.14 € ± SD 101.17 €) or NH (mean = 143.48 € ± SD 95.28 €).
Conclusion. Elderly patients coming in ED have different characteristics, outcomes and recourses consume by referral pattern.

Key words
• older age
• health care survey
• delivery of care
• appropriateness of emergency health care
• administrative database

INTRODUCTION

The age distribution of the population is shifting towards older age in most countries, owing to a combination of a longer life expectancy and falling fertility rates [1]. The elderly are an ever-increasing population in emergency medicine too, accounting for 12-24% of all emergency department (ED) visits. They go to the ED more often than younger adults; they arrive with a higher level of emergency and more severe medical conditions; they undergo more tests; they are more likely to be hospitalized; they are at greater risk of death; and their ED stays are longer [2]. The use of EDs has increased dramatically in developed countries over the last twenty years, and much of this increase is attributed to inappropriate or non-urgent visits [3], making it necessary to monitor and analyze this phenomenon in order to address the characteristics and appropriateness of ED visits, since providing such secondary-level hospital care costs more than the primary care system. In general, self-referred (SR) patients who go to the ED instead of a primary care provider (PCP) are characterized by a lack of continuity of care and their PCP is not well-informed about their condition. ED resources are diverted from life-threatening situations to minor health problems [4]. One study reported that walk-in patients tend to go directly to a local ED not only for out-of-hours emergencies, but also – in urban areas – for non-urgent visits during office hours, because they often feel there are barriers to primary care. Accessibility by public transport, restricted opening hours, a subjective feeling of urgency of the illness/injury, language barriers or, in some cases, the need for anonymity are reportedly major reasons for self-referral to ED services [5]. Several studies in the literature found substantial differences between patients who walk in to ED and patients who attend out-of-hours primary medical care services. In particular, a recent Swiss study reported that patients consulting the latter were older, more often female and presenting with non-injury-related medical problems by comparison with patients going to the ED [6]. No studies so far have focused specifically on analyzing how elderly SR patients use EDs.

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There is an important role for EDs in providing urgent care for elderly patients referred by long-term care institutions, such as nursing homes (NH), to deal with sudden-onset diseases or injuries, or as the first step towards hospital admissions [7-9]. Although NH residents account for a small proportion of all ED patients [10, 11], their complex care needs take up a large share of resources. It is also common knowledge that many of the referrals to EDs involving patients coming from long-term care facilities could have been prevented (these situations are also known as ambulatory care-sensitive conditions; ACSCc) [12-15], and that is why new strategies are needed to avoid institutionalized patients being transferred to EDs by providing an appropriate level of care in the right setting, especially bearing in mind the increasing strain on EDs reported in many publications [16, 17].

In this study we analyzed the pattern of ED attendance involving patients aged 65 or more referred by NH, or by a primary care physician (PCP, *i.e.* general practitioners, available during and outside office hours, specialist emergency medical services), or in SR cases, in terms of patients' characteristics, management, outcomes. Our aim was to gain new insight on ED usage by elderly patients, optimizing the consumption of health resources, and rationalizing the provision of health care services.

METHODS
Context
In Italy, medical emergencies may be dealt with by different physicians depending on the time when help is needed. Family physicians or general practitioners (GP) may be available from 8 a.m. to 8 p.m., Monday to Friday, and from 8 to 10 a.m. on Saturdays. On public holidays and out of hours patients can be seen by a GP on call (GPc) service run by the local public health agency: patients may be seen at home or at the doctor's office, depending on their conditions, in the same was as during their usual GP's office hours. This out-of-hours medical service can be reached by patients by phone or they can go the doctor's office. The hospital emergency department (ED) is a public facility meant to provide episodic urgent and emergency services 24h/day 7 days/week, but there is no restricted access system and patients can also walk in to the department (self-referral mode).

Study design
We conducted a retrospective cohort study in urban general Emergency Departments localized in the catchment area of Local Public Health Agency n. 18, Veneto Region, North East Italy, with approximately 65 000 visits per year. We analyzed the data on ED attendance by patients aged 65 years or more, residing within the area of the Local Public Health Agency n. 18 (no. = 18 648) in the Veneto Region of North-Eastern Italy, for the year 2010 (1 January to 31 December).

The database includes demographic details (patients' age, gender, citizenship) and logistic and management aspects such as: date of arrival at the ED, time of arrival and departure from ED, Observation Unit activation, triage nurses' color coding on admission, physician's

judgment of level of urgency on admission; patients were also classified as daytime or night-time cases for the purposes of our analysis (daytime being from 8 a.m. to 8 PM, night-time from 8 p.m. to 8 AM).

There are four triage color codes: white (not-urgent/routine conditions); green (urgent condition requiring assessment within a couple of hours for medical or emotional reasons); yellow (acute, potentially life-threatening emergency condition, rapidly deteriorating with a risk of vital functions failing); red (immediately life-threatening emergency conditions). The possible outcomes of each ED visit were: death at the ED, discharge home, referral to ambulatory services after discharge for follow-up, hospitalization, or withdrawal. The database also contains details on patients' mode of referral, and for this study purpose were classified in three groups:
1) visits by individuals institutionalized in nursing homes (NH group);
2) visits by community-dwelling patients sent to the ED by their GPs or other primary care professionals, or the emergency medical service (EMS) (PCP group);
3) walk-in patients whose visit to the ED is at their own discretion, *i.e.* self-referred cases (SR group).
Diagnostic and therapeutic procedures are recorded in the database according to the ICD-9 procedural codes.

The dataset also contained information on the main diagnoses, coded according to the ICD-9-CM, 1997 version, from which the ambulatory care sensitive conditions (ACSC) were also derived [14].

The cost of diagnostic and therapeutic procedures was established from the Veneto Region's tariffs [18]. In particular, we considered the costs of all procedures implemented during a patient's stay at the ED, also analyzing four cost sub-categories: radiological imaging, laboratory tests, electrophysiological tests, and specialist visits.

Data analysis
We summarized our data as means and standard deviations (SD) for continuous variables, and as numbers (percentages) of patients for categorical variables. We used the χ^2 test to identify significant differences in the frequency distribution of the categorical variables by group. ANOVA was used to identify significant differences between means of the continuous variables for more than two groups. The Kendall rank correlation coefficient was applied to test the agreement between triage nurses' and doctors' judgments of the urgency levels at the time of discharge. Multivariate logistic regression analyses were performed using the different outcomes as dependent variables, the mode of referral as the independent variable, and the covariates for adjustment included sex, age group, citizenship and triage color code. A linear regression was performed using the costs or the number of procedures performed at the ED as the dependent variable, the mode of referral as the independent variable, and the above-mentioned covariates. All analyses were performed using STATA software 12.

The data analysis was performed on anonymized aggregated data from the official database containing all the characteristics of each ED access. The data of Local Health Authority registries can be used as aggregated

data for scientific studies without further authorizations (Garante per la protezione dei dati personali, Deliberazione 1 March 2012, n. 85). The study complies with the Declaration of Helsinki and with Italian Law, Decree n. 196/2003 to protect personal data.

RESULTS

In 2010, elderly made 18 648 visits to the ED, accounting for 38% of the 49 102 visits made to the ED. The elderly patients were referred by PCPs in 43.09% of cases, 1.42% came from NH, and 55.24% were SR cases. The patients' visits characteristics by referral group are shown in *Table 1*.

The results of logistic regression analyses showed that the aOR for the white tag in triage (non-urgent visits) was significantly higher for the SR group, whereas the aOR for ACSCs was significantly lower. The concordance between nurses triage assessment and the doctors judgment of urgency level resulted very high in all categories of patients with no significant differences, being in each case tau > 0.80.

The aOR for hospitalization was also lower for SR patients. The aOR for mortality was higher for NH patients *(Table 2)*. The outcome of multivariate analysis by diagnostic categories is shown in *Table 2*: patients referred by PCPs had higher proportions of cardiovascular diseases; SR had a higher aOR of presenting with musculoskeletal disorders, and a lower aOR for "medical" conditions; the NH cases included a larger proportion of lung diseases; finally, injuries were more common among the SR and NH patients *(Table 2)*.

When the groups were compared in terms of the demand on ED procedures, the SR patients tended to undergo fewer total procedures (mean = 10.17 ± SD 9.02) than those referred by PCPs (mean = 14.32 ± SD 9.26) or NH (mean = 15.84 ± SD 8.41), and the SR patients underwent radiological imaging, laboratory tests and electrophysiological tests less than the other groups. In contrast, the SR patients had slightly more specialist visits than the other groups. The average costs for all procedures were lower for the SR patients (mean = 106.04 € ± SD 84.90 €) than for those referred by PCPs (mean = 138.14€ ± SD 101.17 €) or NH (mean = 143.48 € ± SD 95.28 €) (data not shown). These findings were confirmed by linear regressions showing a significant negative correlation between the SR patient's need for procedures and the related costs by comparison with the reference PCP group *(Table 3)*.

DISCUSSION

In our sample, the proportion of elderly patients among all those attending EDs was higher than reported elsewhere in the literature, *i.e.* 38% as opposed to 12-24% [2], and there was a preponderance of the female gender (55.7%). This picture reflects the structure of the study population in that overall life expectancy is higher in Italy (and in the Veneto Region in particular) than in other countries, especially for women [19].

The referral pattern emerging for elderly people visiting the ED showed that the majority of patients were self-referred (55%), while under 2% were nursing home residents (this finding is consistent with other studies

[20, 21], and the remainder were referred by a primary care professional. This distribution of referral patterns underscores the common tendency for people to go directly to the ED without consulting a PCP first. This phenomenon has been described in other reports [5] and it has been hypothesized that the general accessibility of ED facilities by public transport, the subjective sense that the patient's health problem is urgent, and the existence of barriers to accessing primary care services could explain this extended demand for care at the ED. In particular, patients tend to perceive the need for advanced diagnostic facilities and are often convinced that the hospital specialist is better qualified to deal with their problem [22]. Other reasons relate to the lack of continuity of primary care for the elderly: in fact, a recent Canadian study reported that a greater continuity of care with family physicians reduces elderly people's visits to the ED, particularly among those living in urban areas [23].

We found that NH residents and SR patients were more likely to go to an ED out of hours (at night or during the week-end) than patients referred by a PCP. This is probably due to a limited reliance on out-of-hours primary care services (especially GPc), which are often underutilized. On the other hand, a Dutch study on the general population's use of out-of-hours medical services found the elderly more likely to consult a GPc than younger individuals, especially for non-traumatic medical reasons [24].

As for the appropriateness of recourse to an ED, the proportion of triage white tags in the sample of elderly patients as a whole (38%) was much higher than reported elsewhere [25]. After adjusting for sex, age, and citizenship, the SR patients had higher odds of being classified as non-urgent visits than PCP-referred patients. These data show that the elderly also tend see the ED as a provider of non-urgent care and their potentially inappropriate use of it diverts ED resources from life-threatening situations to minor health problems. SR patients whose problems are not urgent may prefer to go to the ED because they count on its diagnostic and therapeutic capabilities and the ready availability of tests and specialist consultations all in one place [26], instead of having to wait the long time it can take to obtain a scheduled appointment with a specialist. As mentioned in many other publications, it is estimated that most SR walk-in patients could be treated by a GP, a GPc or a nurse, or simply receive advice over the telephone [24] and, when it comes to elderly patients, the absence of chronic disease and a lack of social support are the main factors associated with their inappropriate ED use, while self-reported urgency is a poor indicator of appropriateness [27]. The lower proportion of urgent conditions among SR patients compared with PCP groups is also indirectly supported by their lower aOR for activation of the ED's Observation Unit (EDOU). This probably means that SR patients are more often dischargeable without any further careful monitoring. Our SR group was likewise significantly less likely to be admitted to hospital, even after adjusting for level of urgency and a shorter overall stay at the ED. The rates of ambulatory visits after discharge were surprising: all the

Table 1
The study sample's characteristics by referral group

	GP/GPc /EMS = PCPs*a 6982 (43.09%)		Nursing home 230 (1.42%)		Self-referral 8990 (55.24%)		Total 16 202		p
	No.	%	No.	%	No.	%	No.	%	
Gender									
M	3000	42.97	66	28.70	4114	45.76	7180	44.32	<0.001
Age									
Mean (SD) yrs	80.09 (7.78)		84.08 (7.66)		77.08 (7.31)		78.48 (7.70)		<0.001
Out-of-hours									
Holidays	1305	18.69	69	30.00	2478	27.56	3852	23.77	<0.001
Night-time	1229	17.60	61	26.52	2086	23.20	3376	20.84	<0.001
Mode of arrival									
Ambulance	3909	62.62	212	93.81	1149	14.63	5270	36.80	<0.001
Own means	2333	37.38	14	6.19	6703	85.37	9050	63.20	
Triage color code									
Red	271	3.88	27	11.74	103	1.15	401	2.48	
Yellow	2705	38.75	75	32.61	2204	24.61	4984	30.83	<0.001
Green	1904	27.28	74	32.17	2695	30.10	4673	28.91	
White	2100	30.09	54	23.48	3952	44.14	6106	37.78	
Medical urgency level									
Red	269	3.86	24	10.43	105	1.17	398	2.46	
Yellow	2296	32.91	67	29.13	1680	18.79	4043	25.04	<0.001
Green	2639	37.83	97	42.17	3879	43.38	6615	40.96	
White	1772	25.40	42	18.26	3278	36.66	5092	31.53	
Ambulatory care-sensitive conditions									
yes	1041	14.91	39	16.96	717	7.98	1797	11.09	<0.001
Emergency Department (ED) Observation Unit activation									
yes	828	11.86	22	9.57	737	8.20	1587	9.80	<0.001
Length of stay (LOS)									
Mean (SD) hrs	8.52 (16.11)		7.36 (10.71)		6.44 (12.08)		7.35 (13.98)		<0.001
Outcomes									
Death	35	0.50	4	1.76	16	0.18	55	0.34	
Discharge	646	9.28	20	8.81	1991	22.18	2657	16.44	
Hospitalization	2803	40.26	113	49.78	1664	18.54	4580	28.33	<0.001
Transfer	34	0.49	2	0.88	64	0.71	100	0.62	
Withdrawal	417	5.99	3	1.32	486	5.41	906	5.60	
Ambulatory	3028	43.49	85	37.44	4755	52.97	7868	48.67	
Triage tag consistency									
Kendall's tau	0.86		0.83		0.82		0.84		
Costs in Euro (mean ± SD)									
Imaging	55.58 ± 78.84		59.83 ± 75.74		41.50 ± 60.86		47.83 ± 69.75		<0.001
Specialist visits	24.54 ± 17.94		21.65 ± 19.73		25.87 ± 14.39		25.24 ± 16.12		<0.001
Laboratory tests	46.65 ± 41.36		50.59 ± 39.69		30.23 ± 39.37		37.60 ± 41.08		<0.001
Electrophys	7.94 ± 9.34		8.18 ± 8.33		5.10 ± 8.27		6.37 ± 8.87		<0.001
All procedures	**138.14 ± 101.18**		**143.48 ± 95.28**		**106.04 ± 84.90**		**120.40 ± 93.7**		<0.001

* GP: general practitioners. GPc: GP on call. EMS: emergency medical service. PCP: primary care provider.

Table 2
Results of logistic regression on Emergency Department (ED) processes, outcome and appropriateness. Dependent variable: referral by PCPs (GP/GPc/EMS = reference category)*

	Nursing home			Self-referral		
	OR	CI	p	OR	CI	p
Process[a]						
Night-time	1.67	1.24-2.25	0.001	1.43	1.32-1.55	0.000
Holidays	1.74	1.30-2.33	0.000	1.71	1.58-1.85	0.000
ED observation unit	0.72	0.46-1.13	0.159	0.70	0.63-0.78	0.000
Appropriateness of ED access[a]						
White color code	1.03	0.78-1.34	0.819	1.98	1.85-2.12	0.000
ACSC	1.09	0.76-1.56	0.613	0.53	0.48-0.59	0.000
Outcomes[b]						
Mortality	2.48	1.05-5.86	0.037	0.81	0.51-1.30	0.395
Discharge	1.00	0.62-1.61	0.981	2.39	2.16-2.63	0.000
Hospitalization	1.14	0.84-1.53	0.379	0.45	0.42-0.49	0.000
Transfer to other institute	1.15	0.26-4.91	0.850	1.93	1.25-2.99	0.003
Withdrawal	0.27	0.08-0.86	0.027	0.62	0.54-0.71	0.000
Diagnosis[a]						
Neoplasm	0.50	0.12-2.04	0.335	0.51	0.39-0.66	0.000
Endocrine, nutritional and metabolic disease, immunity disorders	1.31	0.73-2.33	0.352	0.39	0.31-0.47	0.000
Blood and blood-forming organs	1.87	1.06-3.30	0.028	0.38	0.29-0.49	0.000
Mental disorders	0.56	0.07-4.14	0.578	0.70	0.48-1.02	0.068
Nervous system and sense organs	0.82	0.41-1.61	0.571	0.86	0.75-0.99	0.049
Circulatory system	0.55	0.36-0.84	0.006	0.71	0.64-0.77	0.000
Respiratory system	1.66	1.13-2.42	0.009	0.50	0.44-0.58	0.000
Digestive system	1.48	0.85-2.59	0.160	1.05	0.89-1.23	0.522
Genitourinary system	1.27	0.51-3.16	0.597	1.16	0.92-1.46	0.204
Musculoskeletal system	0.18	0.02-1.35	0.097	2.29	1.91-2.76	0.000
Undefined syndromes	0.73	0.53-1.00	0.055	0.80	0.74-0.86	0.000
Injury or poisoning	1.49	1.14-1.03	0.009	2.05	1.90-2.22	0.000

[a] Covariates for adjustment: sex, age and citizenship.
[b] Covariates for adjustment: sex, age, triage and citizenship.
* PCP: primary care provider. GP: general practitioners. GPc: GP on call. EMS: emergency medical service.

groups of patients showed very high proportions of this outcome variable (43% HCP, 37% NH, 53% SR) and these visits were most frequent among the SR patients. This might be a novel indicator of the improper use of resources, since the primary care services are the most appropriate setting for providing ambulatory care. The number of procedures performed at the ED and the related costs were understandably lower for SR patients than for PCP-referred patients because the former were more likely to arrive with non-urgent conditions, and thus required fewer diagnostic procedures.

Finally, the consistency between triage nurses' and doctors color coding was strong for all groups, with no significant differences emerging between them (Kendall tau > 0.80), meaning that there was no disagreement as to the level of urgency (and the appropriateness) of patients' ED visits by referral group.

In contrast, the SR group was less likely to have ACSCs than the PCP-referred patients. This result would

seem contradictory, *i.e.* ACSCs should be more common among patients referred by PCPs because, by definition, these conditions are amenable to treatment in the primary care setting, and referral to an ED for such conditions can be prevented with timely and effective outpatient care. A possible explanation may lie in the excessive demand for urgent tests and diagnostic procedures by PCPs in order to avoid medico-legal issues over complicated, frail elderly patients. Another explanation could be that some of these ACSCs are chronic, and patients with chronic diseases are more likely to rely on family doctors to manage their recruitments. Concordantly, multivariate analysis showed that SR patients were less likely to go to the ED for neoplastic, endocrine, hematologic, circulatory or respiratory diseases, probably because there is a greater continuity of the care provided by GPs for such diseases, so the patient calls in the family doctor during exacerbations, rather than going to the ED. The higher likelihood of

Table 3

Results of linear regressions on Emergency Department (ED) services provided and costs. Dependent variable: referral by PCPs (GP/GPc/EMS = reference category)*; covariates for adjustment: sex, age and citizenship

	Nursing home			Self-referral		
Number	β	CI	p	β	CI	p
Total procedures	0.71	-0.47 - 1.89	0.239	-3.52	-3.81 - -3.24	0.000
Radiologic imaging	0.07	-0.09 - 0.24	0.397	-0.14	-0.18 - 0.09	0.000
Specialist visits	-0.90	-0.19 - 0.05	0.085	0.02	0.01 - 0.05	0.019
Laboratory tests	0.74	-0.31 - 1.80	0.169	-3.17	-3.43 - -2.91	0.000
Electrophysiol. procedures	-0.01	-0.10 - 0.04	0.727	-0.18	-0.20 - -0.16	0.000
Costs						
Total procedures	-1.96	-14.04 - 0.11	0.750	-26.93	-29.85 - 24.01	0.000
Radiologic imaging	-0.55	-9.6 - 8.53	0.904	-10.96	-13.15 - -8.76	0.000
Specialist visits	-1.85	-3.96 - 0.25	0.085	0.53	0.02 - 1.04	0.039
Laboratory tests	1.14	-4.10 - 6.40	0.669	-14.17	-15.44 - -2.90	0.000
Electrophysiol. procedures	-0.29	-1.44 - 0.85	0.612	-2.42	-2.70 - -2.14	0.000

* PCP: primary care provider. GP: general practitioners. GPc: GP on call. EMS: emergency medical service.

NH patients having respiratory diseases than patients referred by PCPs is attributable to the higher incidence of pneumonia and aspiration pneumonia in the former, as reported elsewhere [21]. The higher likelihood of ED visits being to deal with injuries for NH residents than for PCP-referred patients is consistent with the higher incidence of falls among nursing home residents, as amply reported elsewhere [28]. On the other hand, community-dwelling patients with injuries go directly to the ED because they may not know of any valid alternative to the hospital to deal with minor traumas because the primary care services lack essential diagnostic and therapeutic tools (*e.g.* X-ray apparatus) and often even the materials for serving basic needs, such as sutures or dressings.

ED patients arriving from NH had a significantly higher risk of dying, though this was a rare event in all referral groups. In all probability, this is because these institutionalized elderly individuals are particularly frail [21].

A limit of the present study consist in the analyses of the direct cost only assessing the consumption of ED tests and procedures performed by elderly patients and not including the cost of physicians and other health care personnel. The study in fact could not measure the time dedicated to a given patient by each type of health care professional during the patient's ED stay.

CONCLUSIONS

This is the first study that analyzed ED visits by referral pattern in the elderly in North-Eastern Italy and shows that patients coming in ED have different characteristics, outcomes and recourses consume. Self-referrals tend to include a higher proportion of non-urgent visits, to occur out of hours, and to coincide with a shorter stay at the ED, lower observation unit activation rates, lower hospitalization rates, and a lower consumption of services in terms of tests and procedures. Patients referred by PCPs and NHs seem to have much the same ED usage patterns in terms of their characteristics, process, and the consumption of resources, although they are presumably very different populations in terms of their disabilities and comorbidities. This is probably because of a "filtering" effect on the part of primary health care professionals.

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