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Trend and determinants of acute inpatient care for the elderly in Italy from 2001 to 2011

G. Liotta[1], F. Gilardi[2], P. Scarcella[1], S. Orlando[3], S. Mancinelli[2], E. Buonomo[2], M.C. Marazzi, L. Palombi[1]

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Abstract

Background. *The population over 64 years of age is the main user of acute hospital care services. The elderly admission rates represent a marker for the appropriateness of the model of care. The aim of this study was to assess trends and determinants of acute in-patient care among the elderly in Italy between 2001 and 2011.*
Study design. *Retrospective analysis of data included in the Italian Hospital Discharge Form Database*
Methods. *Data from the Italian Hospital Discharge Form Database, Italian Ministry of Health, for the years 2001, 2006 and 2011 were analyzed for individuals over 64 years of age. Inpatient admission (> 1 day) rates across Italian Regions were calculated and compared with demographic variables and out-of-hospital care indicators. Univariate and multivariate analysis were used to determine independent relationship among variables.*
Results. *From 2001 to 2011 the elderly hospital admission rate decreased from 302.1/1,000 in 2001, to 222.4 in 2011, accounting for an overall decrease of about 28%. The decline in admission rates was less pronounced among individuals > 74 y (26.4%) than among those 65-74 y (32.1%). Hospitalization rates decreased in all Italian administrative regions between 2001 and 2011, even if the hospitalization rates in 2011 were still very different through the different Italian regions, ranging from 180.3/1,000 in Piedmont to 278.1/1,000 in Molise for people > 64 y.*
The multivariate linear regression was statistically significant in explaining the variations in hospitalization rates among the different Italian administrative regions (F: 3.637; p = 0.024; adjusted R^2 = 0.57) and pointed to the role played by the proportion of the elderly (as percentage of the total population, p=0.043) and the rate of variation of acute care beds from 2004 to 2011 (p=0.001). Variables related to community-based care did not show any association with the hospital admissions rate among the elderly.
Conclusion. *The trend toward decline in elderly inpatient admissions is still present in 2011 as it was in 2001. Determinants of elderly hospital care in Italy are related to the increased number of elderly individuals and the reduction of hospital beds. Out-of-hospital care does not correlate with the variation of in-patient care so the overall care appropriateness could be negatively affected.*

[1] *MD, PhD, Department of Biomedicine and Prevention University of Rome Tor Vergata, Rome, Italy*
[2] *MD, Department of Biomedicine and Prevention University of Rome Tor Vergata, Rome, Italy*
[3] *PhD, Department of Health Economic, DREAM program; MD, LUMSA University, Rome, Italy*

Introduction

Needs of care for the elderly are changing significantly because of the increasing demand of community care coming from individuals suffering from chronic diseases. The demographic and epidemiologic transitions also challenge the National Health Service (NHS) capacity to meet the expanding requests for care.

The *dependency index* (number of individuals aged 0-14 and > 64 out of individuals aged 15-64) in Italy increased from 45% in 1990 to 54% in 2014 (1). More than 25% of the elderly live alone, an increase of 19% in the last ten years (2, 3). Living alone has been identified as a risk factor for inappropriate use of health services (4). Integration of health and social services is crucial to set up a comprehensive care model.

In the framework of this integration, hospital care still represents a resource for improvement of services offered to the elderly population. Hospital care must address the change in the needs of care for admitted patients which mainly depend on the multimorbidity experienced by these patients (5). The main obstacles to change are the poor preparedness of the health system to deliver age-appropriate care for chronic diseases, and the complexity of integrating different aspects of assistance for so challenging multi-morbidities (6). Social isolation is sometimes an additional challenge for health and social services providers. The integration between inpatient and outpatient care still represents a major difficulty for many health systems (7), with no exception for the Italian NHS.

However, in the past the organization of hospital care, especially for the elderly, has been influenced more by the need for expense control than by the characteristics of the demand of care (8). The aim of this study is to assess the trends of the determinants of acute inpatient care for the Italian elderly between 2001 and 2010 and their relationship with demographic trends, out-of hospital care indicators and in-hospital process indicators.

Methods

Data regarding subjects >64 years of age, taken from the Hospital Discharge Database (HDD) operated by the Italian Ministry of Health, were analyzed for the years of 2001, 2006 and 2011. The Italian Ministry of Health usually supplies the researchers with anonymized and de-identified data from the database; it also produces a national annual report on hospital admissions, available online (9) for epidemiologic studies. For these reasons our study does not need specific approval by an ethic committee/institutional review board and written informed consent by participants.

Hospitalizations which lasted 1 day were excluded being mostly emergency-ward visits, which did not involve a hospitalization and for which admission determinants cannot be clearly identified.

The HDD covers all hospital admissions within the Italian NHS. Discharge-data for all public and private hospitals financed by the NHS can be obtained from the database. The HDD, introduced in 1995, gathers informations which stem from the Hospital Discharge Forms (HDF). HDF are filled for each discharge in order to document patients' demographic and health data and to define the right Diseases Related Group (DRG).

Variables included in the analysis as potential determinants of elderly acute hospital admissions longer than one day were selected from a pool covering demography, health and social care and socio-economic parameters.

Hospitalization rates were calculated in relation to the resident population (stratified by age) in each Italian Region, retrieved from the National Institute of Statistics

(ISTAT) website. Percentages of subjects > 64 y receiving Long Term Care (in nursing homes or through home-care services) were retrieved from national data provided by ISTAT and the Ministry of Health, as well as the numbers of beds per 1,000 inhabitants, the number of General Practitioner and the rate of invalidity subsidies.

Statistical analysis

A comparison of the different variables was carried out by using bivariate analysis techniques (T-test or Pearson correlation, statistically significant p-values < 0.05). Univariate and multivariate linear regressions were carried out in order to define the factors independently associated with hospitalization rates variations. SPSS version 20.00 was used for the analysis of all data.

Results

During the year 2011, the HDD recorded 2,735,341 hospital admissions of elderly individuals, (-9,7% compared to 2006) (Table 1). The 2011 decrease follows the 2006 decrease in comparison with 2001: the whole admission decrease from 2001 to 2011 is about 15%. During this decade the overall Italian population of the elderly increased from 10,654,649 in 2001 to 12,301,537 in 2011 (+17.1%). From 2001 to 2011 the elderly hospital admission rate decreased from 302.1/1,000 in 2001 to 222.4.1 in 2011 (-28%) (Table 1).

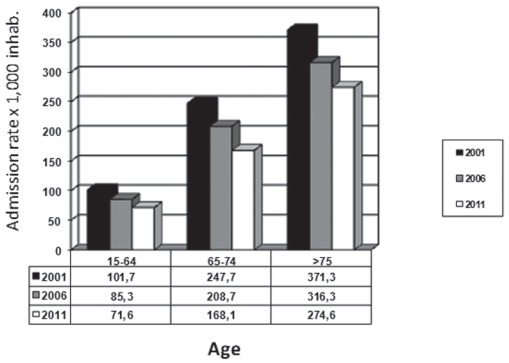

Fig. 1 - Acute in hospital admission rate longer than 1 day by year (per 1000 inhab.)

The decline in admission rates was similar among the elderly and the adult citizens (Figure 1) even if it was less pronounced among individuals > 74 y (26.4%) than those 65-74 y (32.1%).

The reduction of hospitalization rates in all regions between 2001 and 2011 has made the situation more homogenous: hospitalization rates in 2011 were still quite different from one to the other Italian Regions

Table 1 - Elderly acute in-patients admission: absolute numbers, rates, change (Δ) and percentage of change by year

			Δ	Percentage of Δ
Elderly population (absolute numbers)	2001	10,654,649		
	2006	11,592,966	+ 938,317	+11.0%
	2011	12,301,537	+708,571	+ 6.1%
Elderly Admissions >1 day	2001	3,189,520		
	2006	2,999,617	-189,903	- 5.9%
	2011	2,735,341	-264276	- 9.7%
Elderly Admission rate > 1 day (per 1,000 inhabitants)	2001	302.1		
	2006	258.7	-43.4	- 14.4
	2011	222. 4	-36,3	14.0

(ranging from 180.3/1,000 for people > 64 y in Piemonte to 278.1/1,000 in Molise), but the distance between the highest and lowest rates have narrowed (8).

The overall bed/inhabitants rate in 2011 in Italy was 3.29/1,000, varying from 2.95/1,000 in Campania to 3.8/1,000 in Friuli. Again the generalized decrease in bed rates observed in the last five years makes the picture much more homogeneous than in 2006.

In 2006, in Italy, the mean length of stay in the hospital for the elderly was 9.4 days, while it was 9.45 in 2011. The reduction in hospitalizations was associated to a stable average length of stay per admission that follows 10 years of reduction (8). The average stay went from 8.3 in Sicilia to 12.5 in Val d'Aosta, very similar to what was observed in the previous five years.

In Italy, the rate of the elderly receiving any kind of home care services increased from 21.0/1,000 in 2001 to 55/1,000 in 2011. This relevant increase has been associated to a decrease in residential Long Term Care availability from 30/1,000 in 2001 to 25/1,000 in 2011 (10).

Table 2 shows the correlation between the variation of inpatient admissions longer than 1 day from 2006 to 2011 (target variable) and a pool of variables selected in order to represent different care settings and the demographic trend.

The 2006-2011 variation of the elderly hospitalization rate showed a correlation with the pool of variables selected as potential determinants stronger than the ones showed by the 2011 elderly hospitalization rate.

Both demographic variables showed a strong and statistically significant correlation

Table 2. Correlations between in-patient admissions >1 day, 2006-2011, and in-patient/out-patient variables

		Δ elderly admission > 1 day rate (2006-2011)	
		Pearson	**p**
Demographic variables	Elderly/ population ratio (2011)	-0.409	0.041
	Dependency index (2012)	-0.517	0.012
In-patients care variables	Acute care beds rate (per 1,000 inhabitants - 2012)	-0.171	NS
	Private beds/ total beds for acute care ratio (2012)	0.328	NS
	Δ of acute care beds rate (2004-2011)	0.671	0.001
	Elderly one-day admission rate (2011)	-0.623	0.002
	Elderly average length of stay per in patients admission (2011)	-0.370	0.099
	DH admission/in-patients admission ratio (2011)	0.082	NS
Out-patients care variables	General Practitioners rate (per 100,000 inhabitants – 2011)	0.188	NS
	Percentage of the elderly followed up by home care services (2010)	-0.106	NS
	Percentage of the elderly receiving residential care (2010)	-0.481	0.032
	Δ of percentage of the elderly receiving invalidity pension (2005-2010)	-0.457	0.037
	Percentage of the elderly receiving invalidity pension (2010)	0.177	NS

Table 3. Determinants of elderly acute in-patients admission rate variation (2006-2011)

Univariate Linear Regression analysis	Δ in-patients admission longer than 1 day (2006-2011)		
	ß	T-Student	Sig
Elderly/total population ratio (2012)	-0.418	-2.005	0.059
Dependency index (2011)	-0.485	-2.419	0.026
Elderly one-day admission rate (2011)	-0.422	2.030	0.057
Elderly average length of stay per in-patients admission (2011)	-0,370	-1.734	0.099
Δ of acute care beds rate (2004-2011)	0.709	-4.739	<0.001
Percentage of elderly receiving residential care (2010)	-0.481	-2.327	0.032
Δ of elderly percentage receiving invalidity pension (2005-2010)	0.457	2.242	0.037
Multivariate forward stepwise linear regression	Adjusted R^2 = 0.493; F (variation) = 3.637; Sig.= 0.024		
	ß	T-Student	Sig
Elderly/population ratio (2011)	-0.358	2.196	0.043
Dependency index (2011)	0.047	0.105	NS
Elderly one-day admission rate (2011)	-0.285	-1.500	NS
Δ of acute care beds rate (2004-2011)	0.643	3.942	0.001
Elderly average length of stay per in-patients admission (2011)	0.083	0.277	NS
Percentage of elderly receiving residential care (2010)	-0.162	-0.733	NS
Δ of elderly percentage receiving invalidity pension (2005-2010)	-0.198	-0.520	NS

with the target variable, as well as other five variables included in the pool.

The entire setting of seven variables, correlated to the target one, was tested through the univariate linear regression showing different levels of association (Table 3).

Finally the forward stepwise multivariate linear regression model demonstrated statistical significance in explaining the variations in hospitalization rates among the different regions (F: 3.637; p = 0.024; adjusted R2 = 0.57) and pointed out to the role played by the proportion of the elderly (as percentage of the total population) (p=0.043) and the variation of acute care beds per 1,000 inhabitants from 2004 to 2011 (p=0.001) as main determinants of inpatient admission rate reduction. More specifically, the multivariate analysis showed that a higher percentage of elderly individuals was associated to a lower decrease in the admission rate, probably because the higher the number of elderly individuals, the higher the demand for hospital care. In fact, a strong correlation was observed between the percentage of elderly from the population and the percentage of elderly inpatient admissions over the total number of admissions (Pearson correlation = 0.847; p<0.001). A lesser decrease in the admission rate is also associated with the smaller reduction in number of hospital beds (per 1,000 inhabitants) between 2004 and 2011. The remaining variables did not show association with the target variable in the multivariate analysis.

The scatter plot of the multivariate linear regression is shown in Figure 2, with the different Italian regions as plotted points.

Discussion and Conclusions

The declining trend in elderly inpatient admissions is still ongoing, as it was since 2001. The variables associated with elderly inpatients admissions in the multivariate analysis are the proportion of the elderly out of the total population and the variation

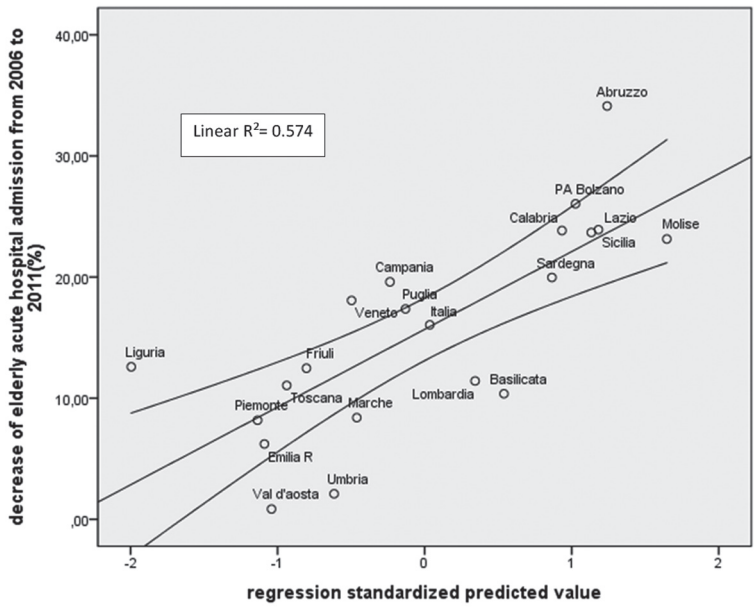

Fig. 2 - 2006-2011 decrease (%) of acute hospital admissions longer than 1 day for elderly patients, according to Region of residence: multivariate linear regression analysis with 95% Confidence Limit.
*covariates (continuous variables): Elderly/population ratio (2011), Δ of acute care beds rate (2004-2011)

in number of hospital beds per 1,000 inhabitants over the period. Similar results were observed in the 2006 assessment (8), making these variables the strongest determinants of elderly hospitalization rates during the decade. However it is likely that there is no more room for further reduction either of the number of hospital beds or the hospitalization rate since currently the Italian hospital beds rate is among the lowest in Europe (11). The percentage of citizens > 64 y will grow in the next decades and is associated with an increasing global burden of disease according to the most recent analysis (6, 12). Finally, in the present study, a strong correlation was observed between the proportion of the elderly in the population and the proportion of elderly inpatients admissions out of the total number of admissions. It is worth noting that the Italian bed availability is among the lowest in the EU (2.7/1,000 inhabitants), although higher than in UK (2.4), but much lower than Germany (up to 5.3) (11). The decrease in bed availability rates between 2000 and 2010 in Italy is one of the highest among European countries so that further reduction of hospital bed numbers is not realistic. The positive relation between bed availability and elderly admissions is observed in all EU countries considered and seems to be confirmed also by the present results. However, whether the different availability of hospital resources affects the effectiveness of hospital health care for the elderly is still an open question. Specific diseases (as stroke) (13, 14) showed a positive impact of hospitalization on case fatality ratios even if these evaluations were usually not adjusted for patient frailty (which is the background upon which diseases impact on elderly patients). Studies which take into account the assessment of frailty are needed to adjust the effectiveness of care and to obtain information on the best strategy for providing appropriate hospital care to the elderly patients.

Official Information on the appropriateness of hospital care, gathered by the Italian Ministry of Health, indicates that admission of > 64 y patients longer than a pre-established threshold is a marker of inappropriate care (15). A link is also established between this indicator and the inefficacy of outpatient care. However, this approach is negatively affected by an obsolete conviction about the importance of one disease as a determinant of appropriate hospital care for the elderly. Most of the elderly are affected by more than one disease and multi-morbidity affects the recovery after the acute phase of any single disease. Multi-morbidity is also a factor contributing to individual frailty which is a comprehensive determinant of response to care (5). It is worth noting that the hospital length of stay was not reduced between 2006 and 2011 as it was in the previous years. In addition, the 2011 national report on hospital care indicated that the admissions of the elderly which were longer than the pre-established threshold were not diminished as expected, considering the reduction in hospital bed availability. This is probably an indirect proof of the difficulties in the management of the elderly patients through the traditional approach hospital-based, monospecialistic, highly technical (5).

Hospital care demand does not seem to be affected by the level of out-of-hospital care, either residential or home care. The quantity of LTC has remained unchanged in the last decade (16, 17). The percentage of elderly receiving invalidity pensions could be considered a proxy for home care as well as its increase over time, since this subsidy is commonly used to pay someone who can assist with personal care. Both residential care and percentage of invalidity pensions appeared to be associated with inpatient admissions by the univariate analysis, but the association disappeared when the multivariate analysis was performed. This was especially true for patients affected by neurologic diseases who can face severe complications from other diseases due to their cognitive and/or neurologic impairments. Neurologic diseases were the only pathologies associated with a frailty condition in a large randomized assessment of frailty carried out in the Lazio Region (Italy) during 2014 (unpublished data). In many cases receipt of home care is not enough if the care approach is not flexible enough to shift to a 12-24 hour service in a short time for at least some days in order to cope with the acute phase of disease. The flexibility of the intensity of care is a key point to define the quality of home care offers. In Italy home care covers only part of the day and a 24 hours coverage is not included in the list of services. Long Term Care (both residential and at home) reaches about 8% of the elderly, which is quite close to the European average (18). Long Term Care, in terms of the percentage of the elderly population reached by these services, is probably less important than the quality of care provided, in order to reduce inpatient admission rates through the reduction of inappropriate admissions.

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Riassunto

Evoluzione e determinanti dell'uso del ricovero ospedaliero per acuti da parte della popolazione anziana italiana tra il 2001 ed il 2011

Background. La popolazione al di sopra dei 64 anni di età è il principale utilizzatore dei servizi di assistenza ospedaliera per acuti. In alcuni casi i tassi di ricovero degli anziani rappresentano un indicatore dell'equilibrio delle cure tra ospedale e territorio. Lo scopo di questo studio è valutare le tendenze e i determinanti dell'ospedalizzazione per acuti in pazienti anziani in Italia tra il 2001 e il 2011.

Disegno dello studio. Analisi retrospettiva dei dati inclusi nelle Schede di Dimissione Ospedaliera

Metodologia. Sono stati analizzati i dati contenuti nelle Schede di Dimissione Ospedaliera relative ai ricoveri superiori ad un giorno degli ultra-cinquantenni negli anni 2001, 2006 e 2011 contenuti nel data base del Ministero della Sanità. I dati sono stati analizzati per regione e confrontati con le variabili demografiche e con gli indicatori relativi alle cure territoriali. Tecniche di analisi univariata e multivariata (correlazione di Pearson, Regressione Lineare) sono state utilizzate per determinare le relazioni tra le diverse variabili.

Risultati. Il tasso ricovero in ospedale tra gli anziani è diminuito da 302,1 / 1000, nel 2001, a 222,4 nel 2011, pari a una riduzione complessiva di circa il 28%. Il calo dei tassi di ammissione è stato meno pronunciato tra gli ultra-settantaquattrenni che non nella fascia di età 65-74 (26,4% vs 32,1%). I tassi di ospedalizzazione sono diminuiti in tutte le regioni italiane tra il 2001 e 2011 anche se rimangono delle notevoli differenze tra le Regioni stesse che vanno dal 180,3 / 1000 degli ultra-sessantaquattrenni in Piemonte al 278,1 / 1000 in Molise.

Il modello di regressione lineare multivariata ha permesso di spiegare una buona parte della variabilità (F: 3.637; p = 0,024; R^2 corretto = 0.57) e ha messo in evidenza l'associazione con la numerosità degli anziani (come percentuale del popolazione totale, p = 0.043) e con il tasso di variazione dei posti letto per acuti 2004-2011 (p = 0,001). Variabili relative alla cura su base comunitaria non hanno mostrato alcuna associazione con il tasso di ricovero ospedaliero tra gli anziani.

Conclusione. La tendenza al declino dei ricoveri ordinari tra gli anziani in Italia è ancora presente come lo era nel 2001. Le variabili associate a questa variazione sono la numerosità degli anziani stessi e l'entità della riduzione dei posti letto. Le cure territoriali non correlano con la variazione delle cure ospedaliere e questo potrebbe influenzare negativamente l'appropriatezza delle cure stesse.

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Corresponding author: Giuseppe Liotta MD, PhD, Associate Professor of Hygiene, Department of Biomedicine and Prevention, University of Rome "Tor Vergata", Via Montpellier 1, 00133 Roma, Italy
e-mail: giuseppe.liotta@uniroma2.it giuseppeliotta@hotmail.com