

## Incidence and costs of hip fractures vs acute myocardial infarction among population of Local Health Authorities Lecce/1 and Lecce/2: a two years survey

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### Abstract

**Background:** in the frame of the aging trend of the Italian population, hip fractures are supposed to be one of the most critical problems to be faced from health care professionals, public health researchers and policy makers.

**Methods and Results:** the objective of this study was to quantify hip fractures' incidence and costs in comparison with a severe-perceived disease such as acute myocardial infarction (AMI) in a sample of 790.000 people living in Lecce area. To evaluate incidence of hip fractures and AMI, we utilized hospitalization database from Local Health Authorities Lecce/1 and Lecce/2. DRGs were used as indicators of direct costs; rehabilitation costs, social and indirect costs were not computed, but the latest available literature data suggest that they exceed the overall direct costs.

**Conclusion:** consistently with national surveys, our results show that hip fractures have an incidence comparable to AMI and higher costs.

*Key words:* ageing, hip fractures, myocardial infarction, prevention

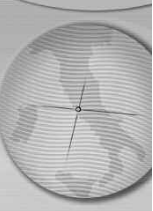
### Introduction

The province of Lecce includes 97 towns with a population of 790,500 inhabitants [1] distributed across two local health authorities (AUSL Lecce/1 and AUSL Lecce/2). The demographic picture of this area differs from that of the regional average, with Lecce having a higher number of people over 65 years of age. The most recent data available, from national survey "Prometeo" - carried out in 1998 by Torvergata University [2], showed that the population of AUSL Lecce/2 had a rising aging index trend (number of people aged over 65 y.o./every 100 subjects aged 0-14 y.o.), going from a value of 84.2 in 1996 to 95.0 in 1998. The Puglia regional ageing index registered by the "Prometeo" survey in the same year 1998 was 82.5, ranging from 62.5 in AUSL Bari/3 to 96.1 in AUSL Foggia/ to 100.3 in AUSL Lecce/1 [2]. Data from National Institute of Statistics (ISTAT) for the whole province of Lecce, showed that the registered ageing index passed from 105.0 in 2001 to 127.0 in 2005, comparable to some of the values observed in northern Italy (Bergamo had

an ageing index of 106.1 while Naples has a value of 60.1). Therefore, it is clear that the population of the Lecce area is older than the regional average and as such represents an interesting case study in Southern Italy, as it probably anticipates conditions which other areas could experience in the very near future in relation to the increasing impact of chronic diseases and their complications, as a consequence of ageing: in Italy, 18.000 patients annually become disabled after a hip fracture and 5% die immediately after the surgical procedure, with an average mortality rate of 15%-25% within the first year [3-7].

### Materials and Methods

In this observational study we analyzed data from the years 1999 and 2000 (the most recent years with complete database available). We chose the number of hospitalizations as indicator of disease incidence and DRGs as an indicator of direct costs. Acute myocardial infarction (AMI) was chosen as a comparator due to similarities with hip fractures, in that AMI has multiple risk factors and a high



prevalence among the general population; furthermore it is expected to have high associated healthcare and social costs, and can be prevented. The study population was defined as all residents in the Lecce province (790,500 inhabitants - with values for AUSL Lecce/1 and AUSL Lecce/2 pooled together); we also included data that relates to those resident patients who were treated in hospitals located outside of the Lecce province; population data was provided by the National Institute of Statistics (ISTAT) [1]. The study was carried out by analyzing only ordinary hospitalizations (SDO) from the official database. Hip fractures were defined by the following ICD-9CM diagnosis codes: 820.0-820.1 (femoral head fractures); 820.2-820.3 (inter-trochanteric femoral fractures); and 820.8-820.9 and 821.1 (other femoral fractures). AMI was defined by code 410 and all of its subcodes. Data on incidence and costs were stratified by gender by 2 age groups (overall and over 65 years old); data were processed using Stata (StataCorp, College Station, USA) and Excel (Microsoft, Redmond, USA) software programs. We performed descriptive statistical analyses of the incidence for gender and age subgroups across the examined age groups.

Analysis of the direct costs was based on the costs ascribed to diagnosis-related groups (DRGs), according to the Ministerial Decree (D.M.) 30-6-1997, considering a Regional average reduction of 15%. Therefore, in this analysis, we used the 1997 DRG rates reduced by 15% in order to be more conservative. DRGs considered relevant to hip fractures were: 209 (surgical procedures on major joints and hip replacement), 210-211 (hip and femur surgery), and 235-236 (hip, femur or pelvis fractures). Costs analysis for AMI included all DRGs that specified this pathology: 121 (cardiovascular diseases with AMI and

cardiovascular complications, patient alive), 122 (cardiovascular diseases with AMI without cardiovascular complications, patient alive), 123 (cardiovascular diseases with AMI leading to death). Moreover, we included DRGs for surgical procedures subsequent to AMI: DRG 107 (coronary by-pass), DRG 112 (angioplasty) and DRG 115 (pacemaker implant in AMI).

## Results

Table 1 shows the incidence (overall and >65 years old) and costs of hip fractures for the whole Lecce area population (AUSL Lecce/1 and Lecce/2) for the years 1999 and 2000. Comparatively, acute myocardial infarction for the same population is given in Table 2; costs concerning DRGs 107, 112, 115 and 123 have been pooled together because of the a small number of cases identified. The incidence per 10,000 inhabitants does not differ notably from the national values as observed by the authors in a previous survey [9-11]. The incidence of hip fractures is almost comparable to acute myocardial infarction, obviously with an opposite male to female ratio. Furthermore, according to the data observed in our previous national survey [9-11], the overall direct costs for hip fractures (3.825.000 euros in 1999 and 3.715.000 euros in year 2000) are higher than the direct costs registered for the hospitalization of acute myocardial infarction (3.368.000 euros in 1999 and 3.231.000 euros in year 2000). Table 3 and Table 4 show the detailed costs for each DRG considered in this analysis relating to both hip fracture and acute myocardial infarction hospitalizations. These results are attributable to the higher value of DRGs associated with hip fractures (because of surgical procedures). Despite this, the perception of the impact of hip fractures among local health authorities is very low.

**Table 1. Incidence and costs of hip fractures in the population of AUSL Lecce/1 plus AUSL Lecce/2**

	Hip fractures (overall) - 1999		Hip fractures (overall) - 2000	
	Males	Females	Males	Females
Incidence per 10.000 inhabitants (all age calsses)	6,72 (n=253)	14,3 (n=595)	6,74 (n=254)	12,67 (n=525)
Incidence per 10.000 inhabitants age specific for people aged > 65	38,6 (n=228)	63,83 (n=535)	38,8 (n=229)	56,44 (n=473)
Overall Direct Costs	3.825.000 euro		3.715.000 euro	

**Table 2. Incidence and costs of AMI in the population of AUSL Lecce/1 plus AUSL Lecce/2**

	AMI (Overall) 1999		AMI (Overall) 2000	
	Males	Females	Males	Females
Incidence per 10.000 inhabitants (all age calsses)	16,5 (n=621)	7,4 (n=307)	15,7 (n=590)	6,8 (n=284)
Overall Direct Costs	3.368.000 euros		3.231.000 euros	

Table 3. Estimated direct costs of hospitalization for hip fractures (1999-2000) - overall and &gt;65 y.o

DIAGNOSIS RELATED GROUPS	YEAR	OVERALL DIRECT COSTS (Euros)	DIRECT COSTS > 65 y.o. (Euros)
DRG 209	1999	1.465.000	1.318.00
	2000	1.743.000	1.568.000
DRG 210-211	1999	1.638.000	1.474.000
	2000	1.446.000	1.301.000
DRG 235-236	1999	722.000	650.000
	2000	526.000	474.000

Table 4. Estimated overall direct costs of hospitalization for AMI (1999-2000)

DIAGNOSIS RELATED GROUPS	YEAR	OVERALL DIRECT COSTS (Euros)
DRG 121	1999	1.096.000
	2000	952.000
DRG 122	1999	1.861.000
	2000	1.667.000
DRG 107 -112 - 115 - 123	1999	411.000
	2000	612.000

### Discussion

This study was carried out directly on the AUSL Lecce/1 and AUSL Lecce/2 hospitalization database, which gave us the opportunity to analyze real hospitalization data, rather than working with estimations. Assumptions were made during the direct costs analysis because we considered a 15% cut-off rate for DRGs values as the average regional reduction rate. A better estimation would have been gained if rehabilitation costs had also been considered (more than 5.000 euros per patient per year according to the latest Italian available study) [8]. With this in mind, direct costs for hospitalization could be considered to be comparable to rehabilitation costs. However, Italian surveys have observed that just 40-50% of patients begin rehabilitation after being discharged from hospital [11]. Furthermore, disability and the accompanying contributions granted by the State (about 620 Euros per month) as well as indirect costs (estimated by the International Osteoporosis Foundation in almost 20% of overall direct costs) should be taken into account in order to produce a more accurate analysis. These considerations make it imperative that we address osteoporosis and its fracture complications (such as hip fractures) according to a "disease management approach" rather than a "component-based approach". In fact, prevention of osteoporosis, early screening examinations and treatment of patients with a higher fracture risk [12] could lead to better results in terms of peoples' health and the more reasonable allocation of expenditures [13-14].

### References

- 1) National Institute for Statistics, Annual Reports 2000 and 2001, ISTAT, Rome.
- 2) "Prometheus", Italian Public Health Atlas, ESIS, Rome 2002.
- 3) International Osteoporosis Foundation. Osteoporosis in the European Community: a call for action. IOF 2002.
- 4) Keene GS, Parker MJ, Pryor GA. Mortality and morbidity after hip fractures. *BMJ* 1993, 307:1248-50.
- 5) Browner WS, Pressman AR, Nevitt MC, Cummings SR. Mortality following fractures in older women. The study of osteoporotic fractures. *Arch Intern Med* 1996, 156:1521-5.
- 6) Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA. Mortality after all major types of osteoporotic fracture in men and women: an observational study. *Lancet* 1999; 353:878-82.
- 7) Official inquiry on osteoporosis. Italian Senate, XIII Commission Public Health, Rome, 2002.
- 8) Visentin P, Ciravegna R, Fabris F. Estimating the cost per avoided hip fracture by osteoporosis treatment in Italy. *Maturitas* 1997; 26:185-92.
- 9) Piscitelli P, Camboa P, Fitto F, Dattoli V, Rosato N, Angeli A., Guida G. et al., Incidence and costs of hip fractures in Italy vs acute myocardial infarction, *Italian Journal of Public Health*, Anno I, Vol. I, Dic 2003.
- 10) Piscitelli P, Camboa P, Fitto F, Dattoli V, Rosato N., Angeli A., Rossini M., Adami S., Guida G. et al., Incidence and costs of hip fractures compared to acute myocardial infarction in the Italian population: a 3 years study. *JBMR*, October 2004, Vol 19 Suppl., SU369 (S292).
- 11) Rossini M., Piscitelli P, Camboa P. et al., Incidenza e costi delle fratture di femore in Italia [Incidence and socioeconomic burden of hip fractures in Italy], *Reumatismo*, 2005; 57 (2): 97-102.
- 12) Adami S, Giannini S, Giorgino R, Isaia G, Maggi S, Sinigaglia L et al. The effect of age, weight, and lifestyle factors on calcaneal quantitative ultrasound: the ESPO study. *Osteoporosis Int.* (2000), 11 (suppl 2): 117-212.
- 13) Corvari L., Disease Management: an overview on this new health approach. *American Druggist* (1995), 212 (4): 41-48.
- 14) Cavallo M.C., Del Vecchio M., Mecosan, Management and Health Economics, N. 20: 8-16.

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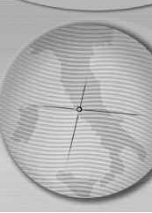
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