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**Effects of socioeconomic status on 30-day mortality and wait for surgery after hip fracture**


Anna Patrizia Barone, Danilo Fusco, Paola Colais, Mariangela D'Ovidio, Valeria Belleudi, Nerina Agabiti, Marina Davoli and Carlo Alberto Perucci

Department of Epidemiology, Lazio Region, Rome, Italy

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Regione Lazio

**Background**

Hip fractures are the leading cause of hospitalization for injuries among the elderly population and have substantial impact on both the patient and the health care system.



However, only a few studies have evaluated the impact of socioeconomic position on patient outcomes or on timing of hip fracture surgery and the results have been discordant.

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**Objective**

To determine whether socioeconomic status plays a role in short-term mortality and waiting time for surgery after hip fracture in Rome, Italy.

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**Data Sources**

The Hospital Information System (HIS) database was used to identify cases of hip fracture and patients' comorbidities .

The Emergency Room Information System (EIS) database was used to increase the probability of identifying patients' comorbidities and to calculate time to death and time to surgery from the arrival.

Deaths during the study period were identified using both the HIS and the Mortality Information System (MIS) of Lazio region.

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**Study population - Inclusion criteria**

From the HIS database, we selected all patients:

- aged at least 65 years
- resident in Rome
- admitted to an acute care hospital in Rome for a hip fracture (ICD-9-CM diagnosis codes 820.0-820.9 in any position) between 1 January 2006 and 30 November 2007


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**Study population - Exclusion criteria**

We exclude patients:

- hospitalized for hip fracture in the previous two years
- with multiple significant trauma (DRGs 484-487)
- directly admitted to Intensive Care Units
- died within 48 hours of admission without intervention
- with a principal or secondary diagnoses of malignant neoplasms (codes 140.0-208.9)

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Outcomes


➤ Mortality within 30 days of hospital arrival for hip fracture

➤ Waiting time for surgery

➤ Intervention within 48 hours of hospital arrival

The interventions were identified by the following ICD-9-CM codes: **total or partial hip replacement** (codes 81.51, 81.52) and **reduction of fracture** (codes 79.00, 79.05, 79.10, 79.15, 79.20, 79.25, 79.30, 79.35, 79.40, 79.45, 79.50, 79.55).

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Exposure


**Index of socioeconomic position**

We used a **city-specific index**, constructed for Rome, based on **data aggregated** at the level of the census tract of residence. Data include **various dimensions of deprivation** (education, occupation, crowding, immigration, family composition, and home ownership).

We defined **three levels of socioeconomic position**:

- I-high
- II-intermediate
- III-low

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Coexisting medical conditions

➤ Chronic comorbidities and/or severity characteristics, potentially associated with the outcomes under study, were chosen among the conditions identified in literature and those empirically tested in the Mattoni-outcome project and in the Euphoric Project.


➤ The potential risk factors were identified on the basis of ICD-9-CM codes registered either in the index hospitalization or in previous hospital or ED admissions during the last two years.

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**Potential risk factors**

Diseases of central nervous system, cardiac and vascular/cerebrovascular disorders, diabetes, hypertension, chronic obstructive pulmonary disease (COPD), chronic renal disease, liver disease, nutritional deficiencies, and others.

Risk factor	ICD-9-CM code	
	Current admission	Previous hospital or ED admissions
Diseases of central nervous system		
Dementias including Alzheimer's disease	290.0-290.4, 294.1, 331.0	290.0-290.4, 294.1, 331.0
Parkinson's disease	332	332
Hemiplegia and other paralytic syndromes	342, 344	342, 344
Ischemic heart disease		
Previous myocardial infarction	412	410, 412
Other forms of chronic ischemic heart disease		411, 413, 414
Other cardiac disorders		
Heart failure		428
Ill-defined descriptions and complications of heart disease		429
Pneumatic heart disease	993-998	991, 993-998
Cardiomyopathy	425	421, 422
Acute endocarditis and myocarditis	745, V15.1, V42.2, V43.2, V43.3, V45.0	745, V15.1, V42.2, V43.2, V43.3, V45.0
Other heart conditions		426, 427
Cardiac arrhythmias		428, 429
Diabetes	250.1-250.9	250, 250.0
Hypertension	401-405	401-405
Circulatory disorders		
Cerebrovascular disease	433, 437, 438	430-434, 436-437, 438
Vascular disease	440-448 (excluding 441.1, 441.3, 441.5, 441.6, 445)	440-448, 557
Chronic obstructive pulmonary disease	491-492, 494, 496	491-492, 494, 496
Chronic renal disease	582-583, 585-588	582-583, 585-588
Other chronic disease (liver, pancreas, esophagus)	571-572, 577.1-577.9, 565, 566	571-572, 577.1-577.9, 565, 566
Bone and joint disorders		
Rheumatoid arthritis and other inflammatory polyarthritides	714	714
Osteoporosis and other disorders of bone and cartilage	733	733
Nutritional deficiencies	260-263, 783.0, 789.4	260-263, 783.2, 789.4
Obesity	278	278
Blood disorders	280-285, 288, 289	280-285, 288, 289



Statistical analysis


**Multivariate regression analysis** was used to assess the effect of socioeconomic position on 30-day mortality and chance of intervention within 48 hours of hospital arrival, controlling for variations in other factors (age, gender, and coexisting medical conditions) that could affect the outcomes under study.

Among all factors potentially associated with the outcomes under study, age and gender were considered as **a priori** risk factors; the others were selected by **stepwise bootstrap procedures**.

We used a **logistic regression** to estimate **30-day mortality** and a **Cox proportional hazard model** to calculate hazard ratios (HRs) of intervention within 48 hours.

To estimate **median waiting times for surgery** by socioeconomic position, **adjusted Kaplan Meyer curves** were calculated, as the proportionality condition was not verified.

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Results (1)

**30-day mortality rate, crude and adjusted RRs, and their statistical significance by level of socioeconomic position**

Socioeconomic position	n. of admissions	30-day mortality rate (%)	crude RR	p-value	adjusted RR*	p-value
I - high	1187	5	1		1	
II - intermediate	3122	6.2	1.24	0.143	1.24	0.14
III - low	742	7.7	1.55	0.019	1.51	0.03

RR: Relative Risk

\* adjusted for: age, gender, COPD, diabetes, cerebrovascular diseases, cerebrovascular diseases Current Admission (CA), dementias, dementias (CA), chronic renal diseases, chronic renal diseases (CA)

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### Results (2)

Proportion of interventions within 48 hours, crude and adjusted HRs, and their statistical significance by level of socioeconomic position

Socioeconomic position	n. of admissions	% interventions within 48 hours	crude HR	p-value	adjusted HR*	p-value
I - high	1187	9.0	1		1	
II - intermediate	3122	6.1	0.66	0.001	0.69	0.002
III - low	742	2.8	0.31	0.000	0.32	0.000

HR: Hazard Ratio  
 \* adjusted for: age, gender, COPD, other forms of chronic ischemic heart diseases, blood disorders, blood disorders (CA), cerebrovascular diseases, cerebrovascular diseases (CA)

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### Results (3)

Crude and adjusted waiting times for surgery by level of socioeconomic position

Socioeconomic position	n. of admissions	% interventions	median waiting times (days)	adjusted median waiting times (days)*
I - high	1187	89.9	6	5
II - intermediate	3122	87.9	7	6
III - low	742	86.5	7	7

\* adjusted for: age, gender, COPD, COPD Current Admission (CA), hypertension, other forms of chronic ischemic heart diseases, blood disorders, blood disorders (CA), cerebrovascular diseases, cerebrovascular diseases (CA), dementias, dementias (CA), chronic renal diseases, chronic renal diseases (CA), vascular disease

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### Conclusions

Our study has shown, for the first time in Italy, the association between socioeconomic position and quality of health care for hip fracture, further contributing to this complex issue.

Our findings are in contrast to the principle of equity in the Italian Health Care System, where universal coverage should guarantee comparable quality of care to all citizens.

Therefore, efforts by National and/or Regional Health Systems are needed to identify and address, in a systematic way, disparities that may be responsive to improvements in health care.

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The study will be published on the  
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**Thank you for your attention**

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