



**Azienda Ospedaliera  
Universitaria di Ferrara**  
*Dipartimento Medico*

**ASPETTI CRITICI DELLE  
EMERGENZE INTRA E  
EXTRAOSPEDALIERE**

**Sabato 24 Marzo 2012**

**Aula Magna delle Nuove Cliniche  
Arcispedale S. Anna, Ferrara**

**Il rischio di ammalarsi  
nel fine settimana**

*Massimo Gallerani  
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*24 Marzo 2012*

# Seasonal and weekly patterns of hospital admissions for nonfatal and fatal myocardial infarction<sup>☆</sup>

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Am J Emerg Med  
2009; 27, 1097–  
1103

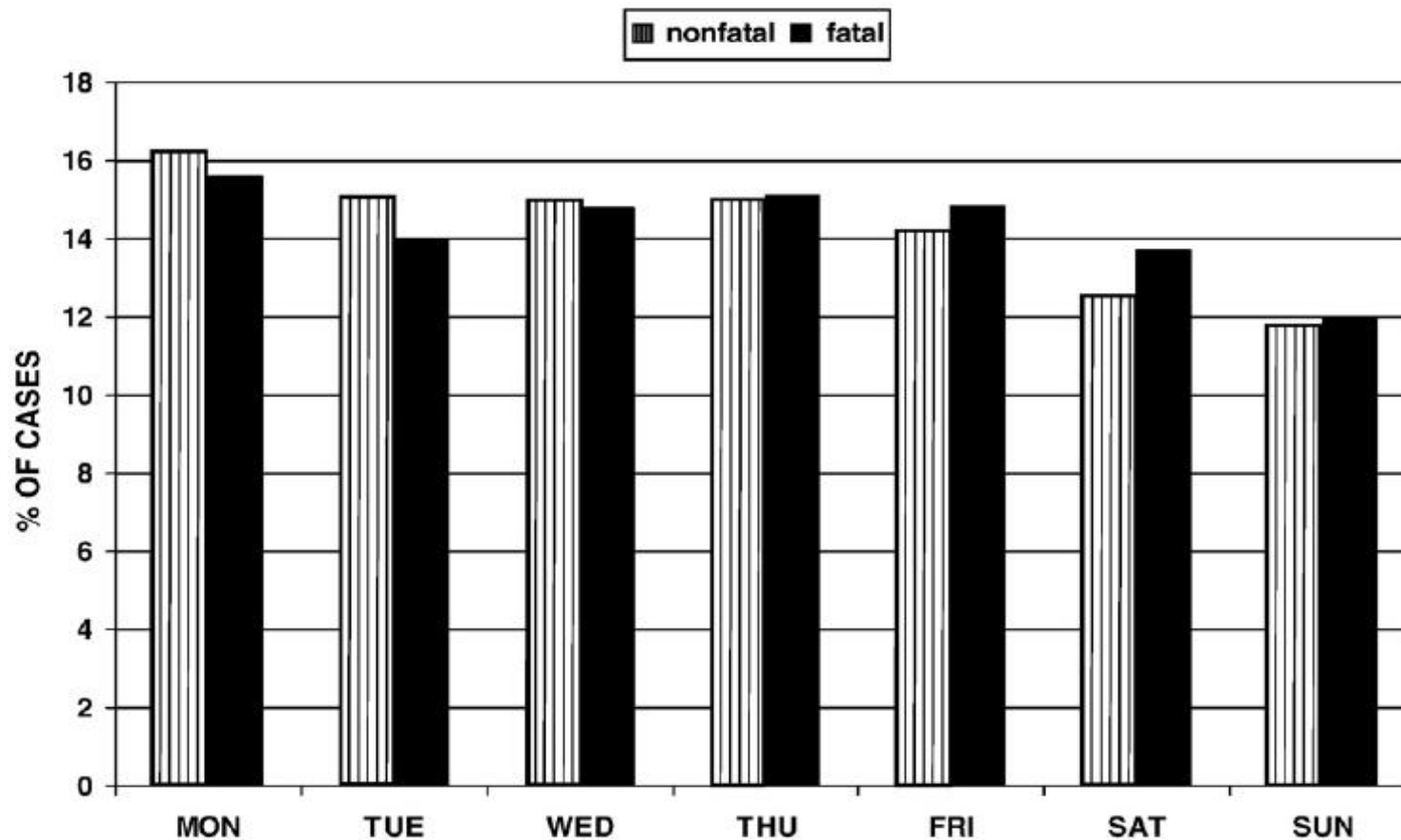


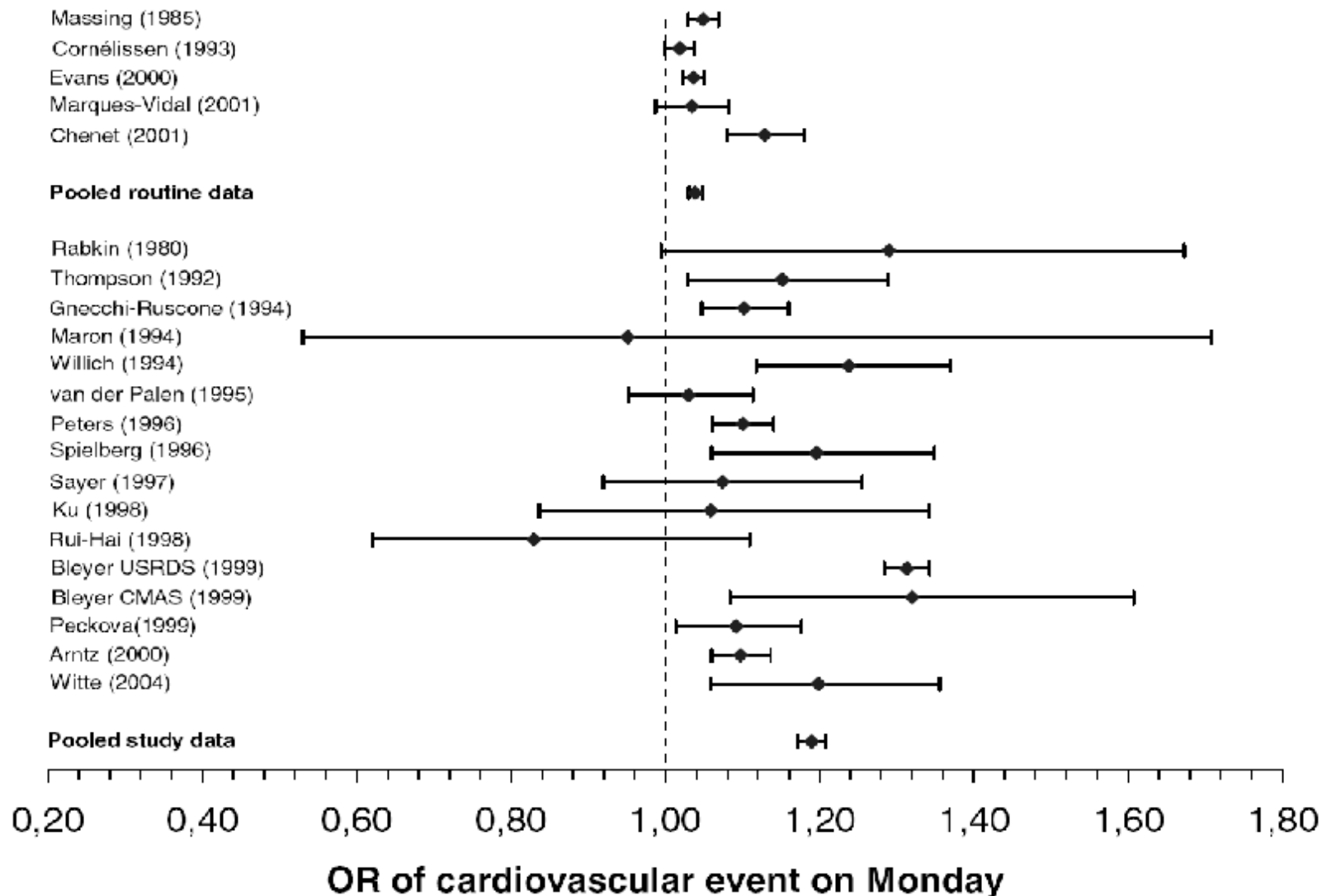
Fig. 3 Weekly distribution of myocardial infarction: nonfatal and fatal events.

Acute myocardial infarction was most frequent on Monday and least on Sunday ( $p < 0.001$ ). Comparing observed vs expected events, there was a significantly higher frequency of cases on weekdays and reduced on weekends, for total ( $p < 0.001$ ), nonfatal ( $p < 0.001$ ), and fatal cases ( $p < 0.001$ ).

# A META-ANALYSIS OF EXCESS CARDIAC MORTALITY ON MONDAY

*D.R. Witte, D.E. Grobbee, M.L. Bots & A.W. Hoes*

European Journal of  
Epidemiology (2005) 20:  
401–406



Odds Ratios  
(OR) for a  
myocardial  
infarction or  
sudden cardiac  
death on  
Monday,

# Monday Preference in Onset of Ischemic Stroke

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Ezio Paolino, MD, Olga la Cecilia, MD,  
Benedetta Boari, MD, Elisa Fallica, MD,  
Enrico Granieri, MD

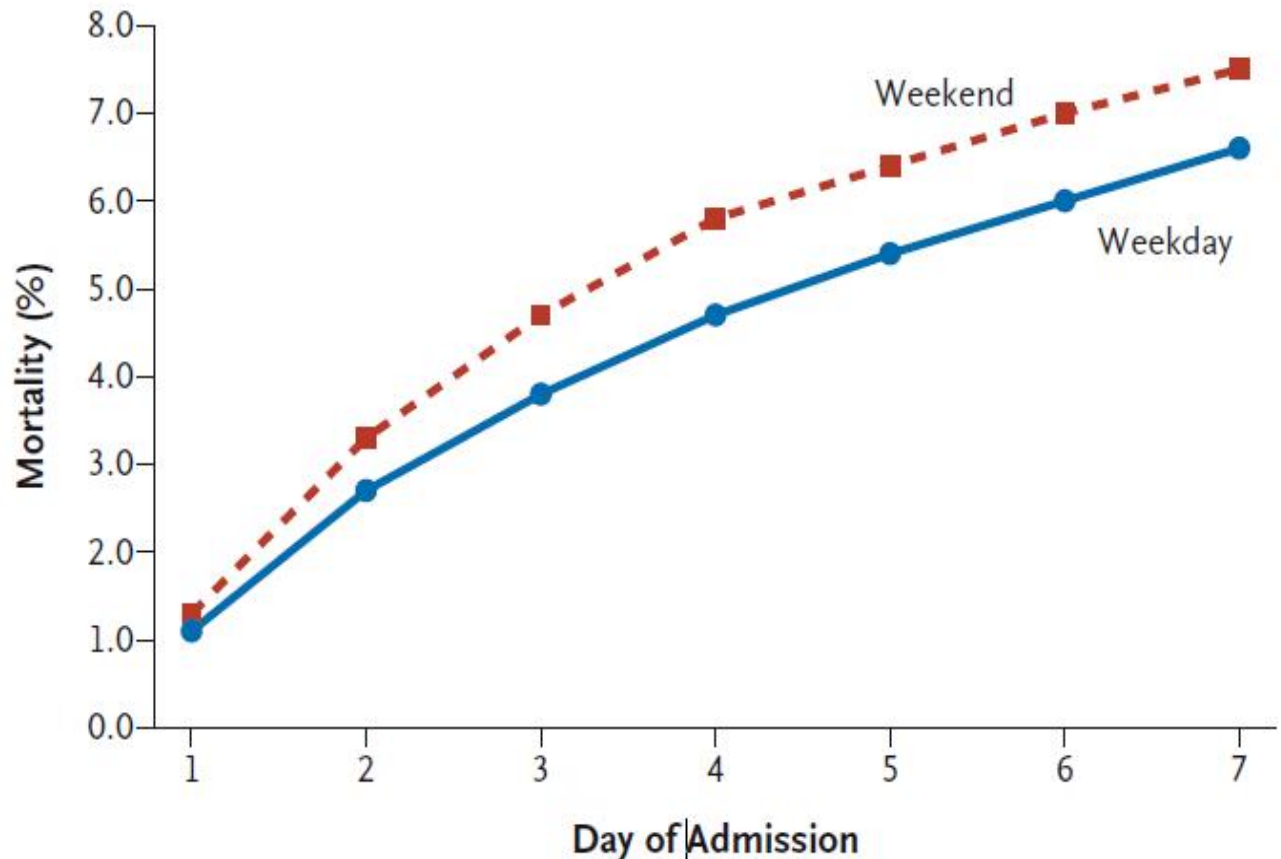
A circaseptan rhythm, with a significant peak on Monday (Figure, Table), was observed for all strokes ( $P$  0.012) and for ischemic strokes ( $P$  0.004). Stratified analyses of selected subgroups (hypertension and diabetes) showed a Monday peak only for nondiabetic patients ( $P$  0.04). For ischemic strokes, the Monday peak was found only for retired patients ( $P$  0.03).

Am J Med 2001; 111: 401-403



# Weekend versus Weekday Admission and Mortality from Myocardial Infarction

For patients with myocardial infarction, admission on weekends is associated with higher mortality and lower use of invasive cardiac procedures. Our findings suggest that the higher mortality on weekends is mediated in part by the lower rate of invasive procedures, and we speculate that better access to care on weekends could improve the outcome for patients with acute myocardial infarction.



**Figure 1.** Mortality for Weekend versus Weekday Admissions According to Day of Admission, 1999–2002.

## MORTALITY AMONG PATIENTS ADMITTED TO HOSPITALS ON WEEKENDS AS COMPARED WITH WEEKDAYS

CHAIM M. BELL, M.D., AND DONALD A. REDELMEIER, M.D.

**TABLE 2.** IN-HOSPITAL MORTALITY ACCORDING TO THE DAY OF ADMISSION.\*

CONDITION	No. OF ADMISSIONS	MORTALITY RATE		ODDS RATIO (95% CI)	
		WEEKDAY ADMISSION	WEEKEND ADMISSION	UNADJUSTED	ADJUSTED†
<b>Positive‡</b>					
Ruptured abdominal aortic aneurysm (ICD-9 codes 4413 and 4414)	5,454	36	42§	1.32	1.28 (1.13–1.46)
Acute epiglottitis (ICD-9 code 4643)	1,139	0.3	1.7¶	5.47	5.28 (1.01–27.50)
Pulmonary embolism (ICD-9 code 4151)	11,686	11	13	1.25	1.19 (1.03–1.36)
<b>Control**</b>					
Myocardial infarction (ICD-9 code 410)	160,220	15	15	1.02	1.03 (1.00–1.06)
Intracerebral hemorrhage (ICD-9 code 431)	10,987	44	44	1.01	1.01 (0.93–1.11)
Acute hip fracture (ICD-9 code 820)	59,670	7	6	0.95	0.97 (0.90–1.04)

(N Engl J Med 2001;345:663-8.)

# Analysis of the Mortality of Patients Admitted to Internal Medicine Wards Over the Weekend

Javier M. et al. American Journal of Medical Quality Online First, on May 19, 2010

The authors analyzed the clinical data of 429 880 adults >14 years of age who were admitted to internal medicine wards in Spain after having presented to the hospitals' emergency departments

Weekend admissions were associated with a significantly higher inhospital mortality than weekday admissions among patients admitted to an internal medicine service (odds ratio [OR] = 1.1; 95% confidence interval [CI] = 1.08-1.14).

Analyses of deaths within 2 days after admission showed larger relative differences in mortality between weekend and weekday admissions (OR = 1.28; 95% CI = 1.22-1.33).

	OR, Short-Term Mortality	95% CI	OR, Overall Mortality	95% CI
Age <sup>b</sup>	2.9	2.8-3.1	2.1	2.08-2.1
Sex (female)	0.96	0.94-0.98	1.05	1.0-1.1
Charlson comorbidity index	1.4	1.3-1.4	1.36	1.35-1.38
DRG weight	2.2	2.1-2.2	1.36	1.35-1.37
Weekend admissions	1.6	1.5-1.7	1.071	1.046-1.097



## Weekend mortality for emergency admissions. A large, multicentre study

P Aylin, A Yunus, A Bottle, et al.

*Qual Saf Health Care* 2010 19: 213-217 originally published online January 28, 2010

### ABSTRACT

**Background** Several studies have identified higher mortality for patients admitted as emergencies at the weekend compared with emergency admissions during the week, but most

**Results** Of a total of 4,317,866 emergency admissions, we found 215,054 in-hospital deaths with an overall crude mortality rate of 5.0% (5.2% for all weekend admissions and 4.9% for all weekday admissions). The overall adjusted odds of death for all emergency admissions was 10% higher (OR 1.10, 95% CI 1.08 to 1.11) in those patients admitted at the weekend compared with patients admitted during a weekday ( $p < 0.001$ ).

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**Conclusions** This is the largest study published on weekend mortality and highlights an area of concern in relation to the delivery of acute services.

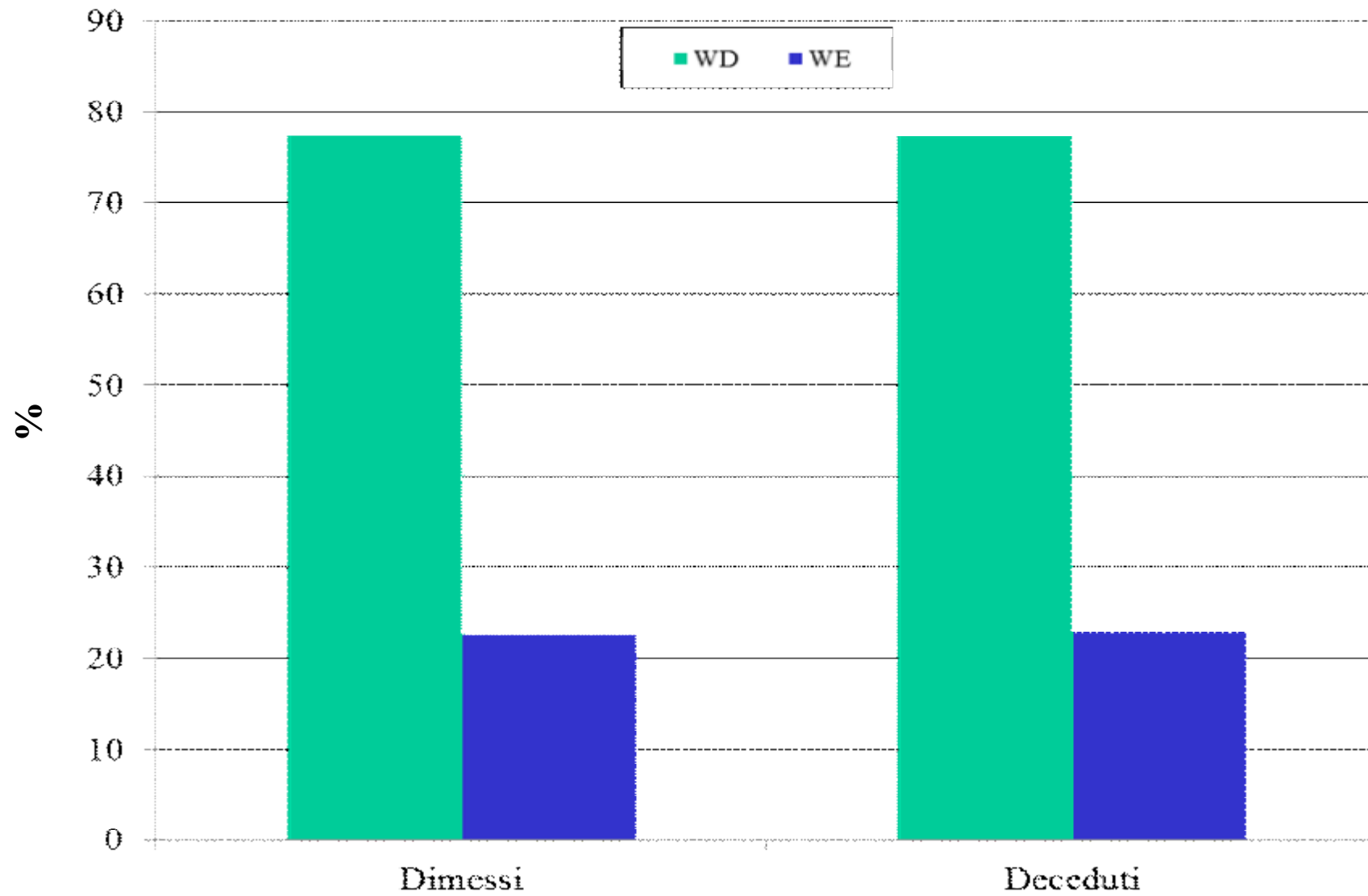
**Table 2** Top 50 causes of death (by volume) for weekend and weekday emergency admissions to acute NHS hospitals 2005/2006

Condition	No. of admissions	Mortality rate		p Value	OR (95% CI)‡
		Weekday admission	Weekend admission		
		Mortality % (number of deaths)			
Condition	N° of Admission	Weekday admission	Weekend admission	P Value	OR (95% C.L.)
All admissions	4 317 866	4.9 (162 639)	5.2 (52 415)	<0.001	1.10 (1.08 to 1.11)
Acute cerebrovascular disease	70 500	27.5 (14 451)	30.2 (5437)	<0.001	1.13 (1.09 to 1.18)
Acute myocardial Infarction	68 932	13.5 (6803)	14.4 (2650)	0.002	1.08 (1.03 to 1.14)
Cardiac dysrhythmias	86 134	1.9 (1270)	2.4 (453)	<0.001	1.31 (1.17 to 1.47)
Congestive heart failure non-hypertensive	56 394	17.9 (7944)	19.6 (2351)	<0.001	1.11 (1.05 to 1.17)
Pulmonary heart disease	16 314	9.1 (1200)	11.0 (349)	0.046	1.15 (1.00 to 1.31)
Aortic, peripheral and visceral artery aneurysms	5573	34.0 (1453)	42.9 (555)	<0.001	1.45 (1.26 to 1.66)
Aortic, peripheral and visceral artery aneurysms (CCS 115)	5573	34.0 (1453)	42.9 (555)	<0.001	1.45 (1.26 to 1.66)
Biliary tract disease (CCS 149)	46 889	2.3 (818)	1.8 (195)	0.047*	0.85 (0.72 to 1.00)
Fracture of neck of femur (hip) (CCS 226)	53 153	13.4 (5232)	12.9 (1820)	0.490	0.98 (0.92 to 1.04)
Intestinal obstruction without hernia (CCS 145)	17 328	10.9 (1452)	11.4 (460)	0.760	1.02 (0.90 to 1.15)
Intracranial injury (CCS 233)	9165	13.2 (829)	12.8 (371)	0.011*	1.20 (1.04 to 1.38)
Other fractures (CCS 231)	24 974	4.9 (875)	4.8 (344)	0.291	1.08 (0.94 to 1.23)
Superficial injury, contusion (CCS 239)	83 086	1.3 (745)	1.1 (297)	0.400	1.06 (0.92 to 1.22)

# AMBITO DI ANALISI

- **Stroke**
- **Infarto miocardico**
- **Scompenso cardiaco**
- **Embolia polmonare**
- **Rottura aneurisma aortico**
- **Alcune patologia acute gastroenteriche**

# Analisi di 582.812 stroke osservati in Emilia Romagna 2000-2010



**Weekend-Weekdays analysis distribution of acute myocardial infarction hospital admissions and analysed subgroups of subjects alive or dead during hospitalization.**

ER database, from January 1999 to December 2009  
 91,122 patients with acute IMA (mean age  $75 \pm 13.8$  years)

	<b>All cases (n= 106.371) (n , %)</b>	<b>Alive after discharge (n = 91.359, 85,9%) (n , %)</b>	<b>Dead during hospitalization (n = 15.012, 14,1 %) (n , %)*</b>
<b>Weekday</b>	<b>76.188 (71,6%)</b>	<b>65.573 (86,1%)</b>	<b>10.615 (13,9%)</b>
<b>Weekend/Holiday</b>	<b>30.183 (28,4%)</b>	<b>25.786 (85,4%)</b>	<b>4.397 (14,6%)</b>

\* between groups dead/alive Chi-square = 7,195 p = 0.007

# Weekend versus weekday hospital admissions for acute heart failure

Massimo Gallerani <sup>a,\*</sup>, Benedetta Boari <sup>a</sup>, Fabio Manfredini <sup>b</sup>, Elisa Mari <sup>a</sup>,  
Cinzia Maraldi <sup>a</sup>, Roberto Manfredini <sup>c</sup>

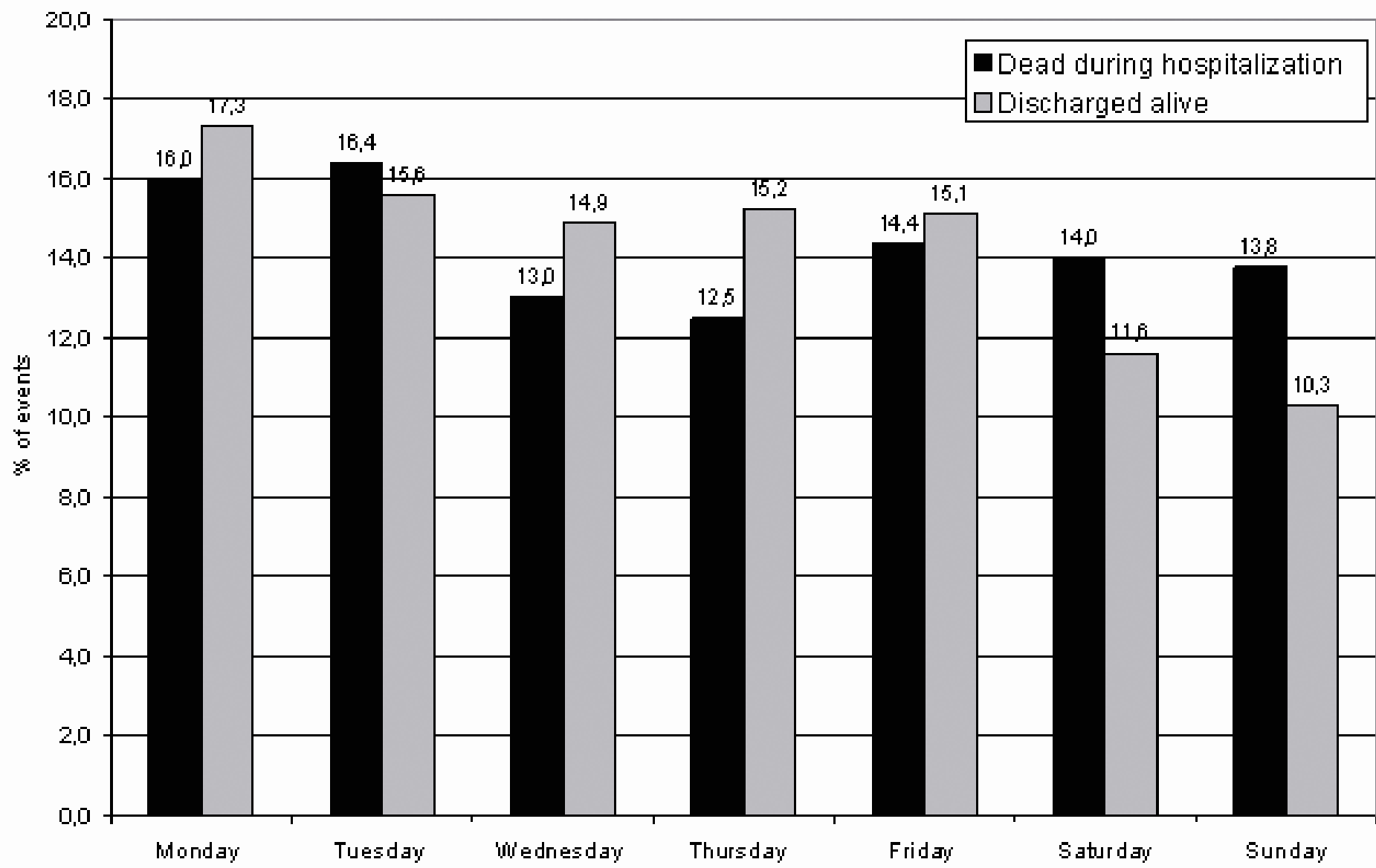
Inter J Cardiol 2010

## Materials and Methods

We considered all SDO of patients hospitalized for heart failure in the

**During the analyzed period, the hospital database contained the records of 15,954 patients (mean age  $77.7 \pm 10.5$  years) with the ICD-9-CM codes of HF (420-429).**

	Acute edema of lung with heart disease NOS or heart failure Acute pulmonary edema with heart disease NOS or heart failure
428.9	Heart failure, unspecified



Weekday and weekend-holiday distribution of heart failure hospital admissions for total subject and analysed subgroups.

	Weekday <sup>*</sup>	Weekend-holiday <sup>**</sup>	Chi-square <sup>a</sup>	p
All cases (n = 9657)	7277 (75.4%)	2380 (24.6%)	95.58	<0.001
Males (n = 4552, 47.2%)	3456 (75.9%)	1096 (24.1%)	1.496	0.221
Females (n = 5105, 52.8%)	3821 (74.8%)	1284 (25.2%)		
Age <60 yrs (n = 430; 4.5%)	326 (75.8%)	104 (24.2%)	11.258	0.01
Age 60-69 yrs (n = 1193; 12.4%)	923 (77.4%)	270 (22.6%)		
Age 70-79 yrs (n = 3058; 31.7%)	2348 (76.8%)	710 (23.2%)		
Age >79 yrs (n = 4976; 51.5%)	3680 (74.0%)	1296 (26.0%)		
CCla = 0 (n = 23, 0.2%)	13 (56.5%)	10 (43.5%)	18.236	<0.001
CCla = 1-2 (n = 731, 7.6%)	560 (76.6%)	171 (23.4%)		
CCla = 3-4 (n = 2529, 26.2%)	1971 (77.9%)	558 (22.1%)		
CCla >4 (n = 6374, 66%)	4733 (74.3%)	1641 (25.7%)		
Fatal cases (n = 1074; 11.1%)	749 (69.7%)	325 (30.3%)	20.517	<0.001
Nonfatal cases (n = 8583, 88.9%)	6528 (76.1%)	2055 (23.9%)		

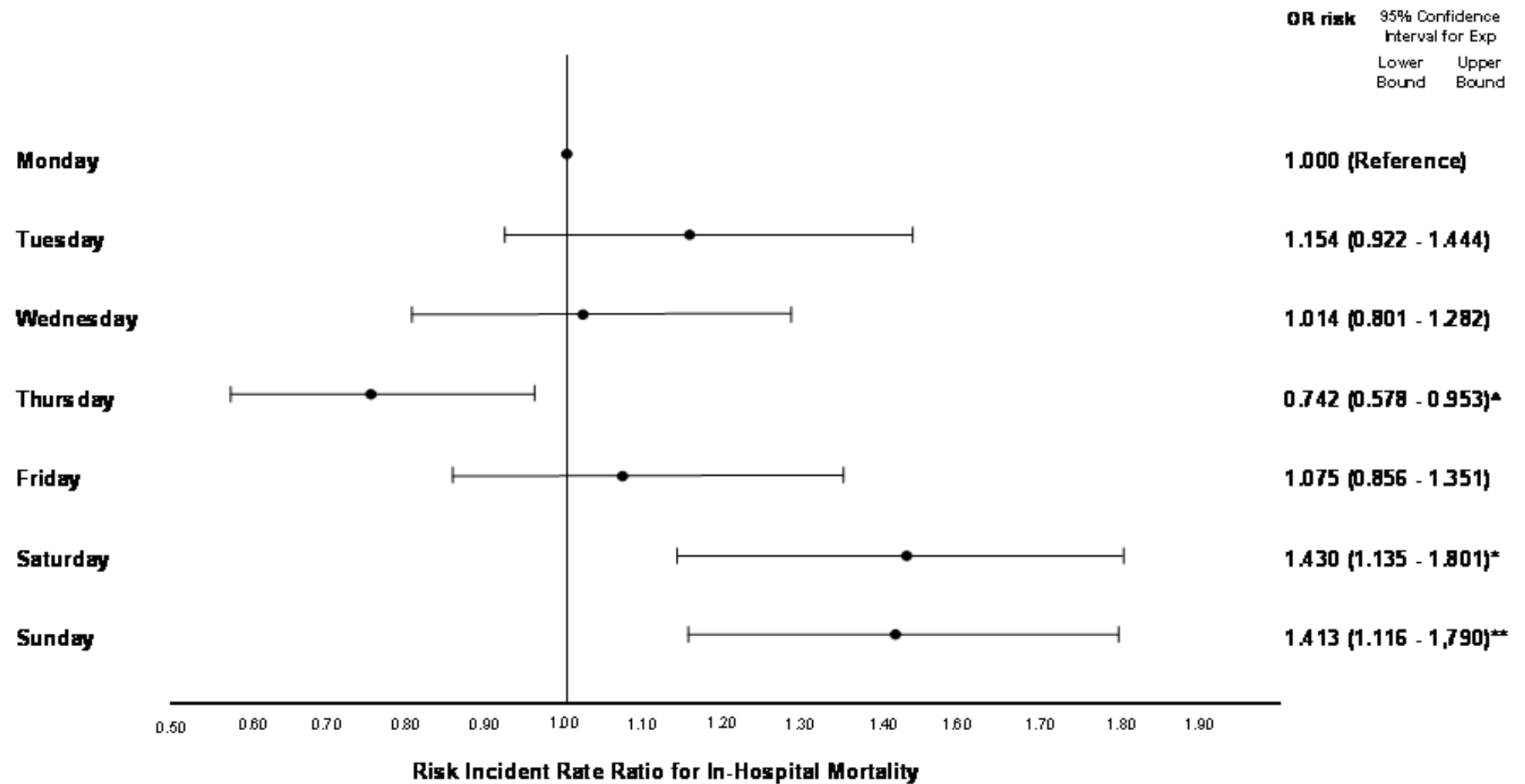
Charlson Comorbidity Index age adjusted = CCl<sub>a</sub>.

\* Expected 71.4%.

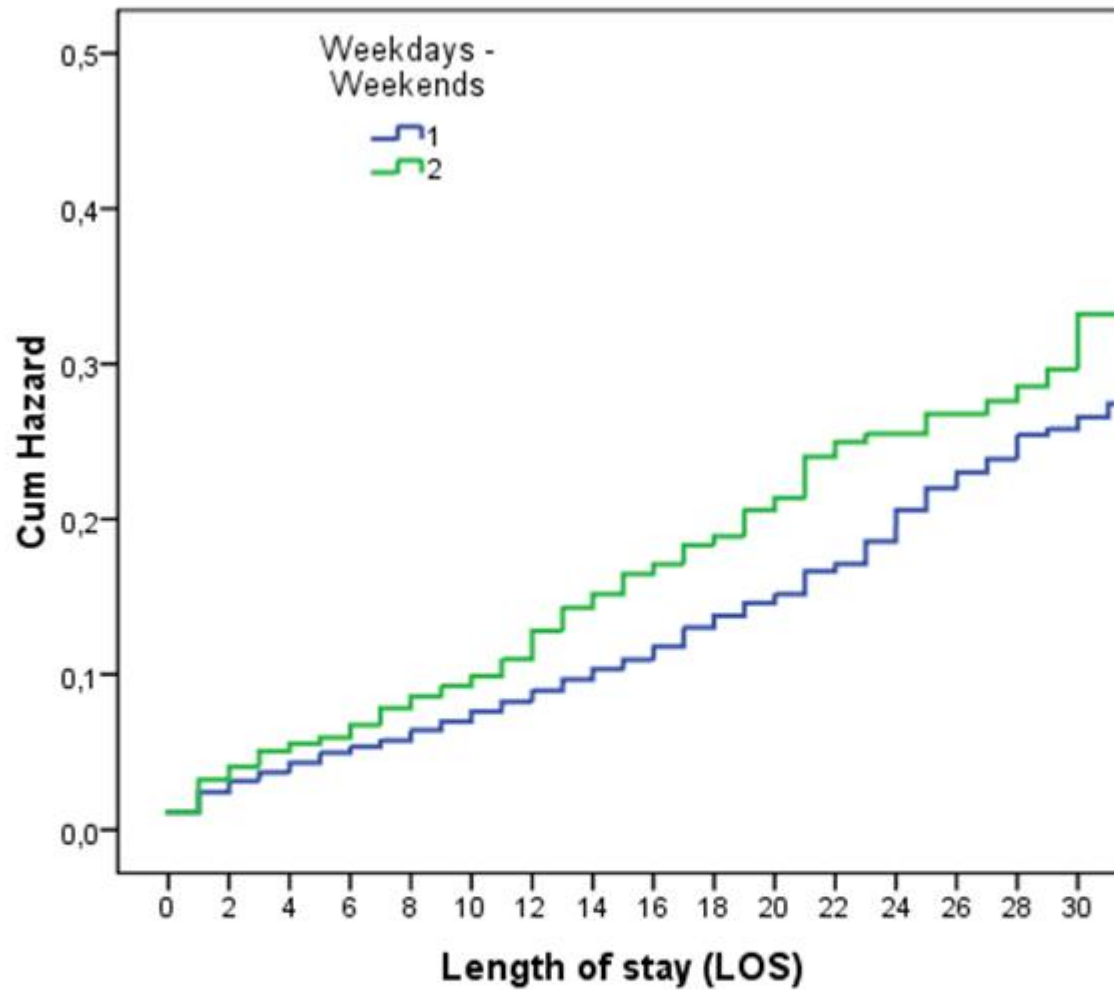
\*\* Expected 28.6%.

<sup>a</sup> Statistical significance of p value is based on the Bonferroni correction for multiple comparison.

# WEEKEND VERSUS WEEKDAY HOSPITAL ADMISSIONS FOR ACUTE HEART FAILURE : Logistic analysis for admission day of the week and risk for in-hospital death



▲ p = 0.02; \* p = 0.002; \*\* P = 0.004



Omnibus Tests of Model Coefficients<sup>a,b</sup>

-2 Log Likelihood	Overall (score)			Change From Previous Step			Change From Previous Block		
	Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
16203,268	291,845	5	,000	336,727	5	,000	336,727	5	,000

a. Beginning Block Number 0, initial Log Likelihood function: -2 Log likelihood: 16539,995

b. Beginning Block Number 1. Method = Enter

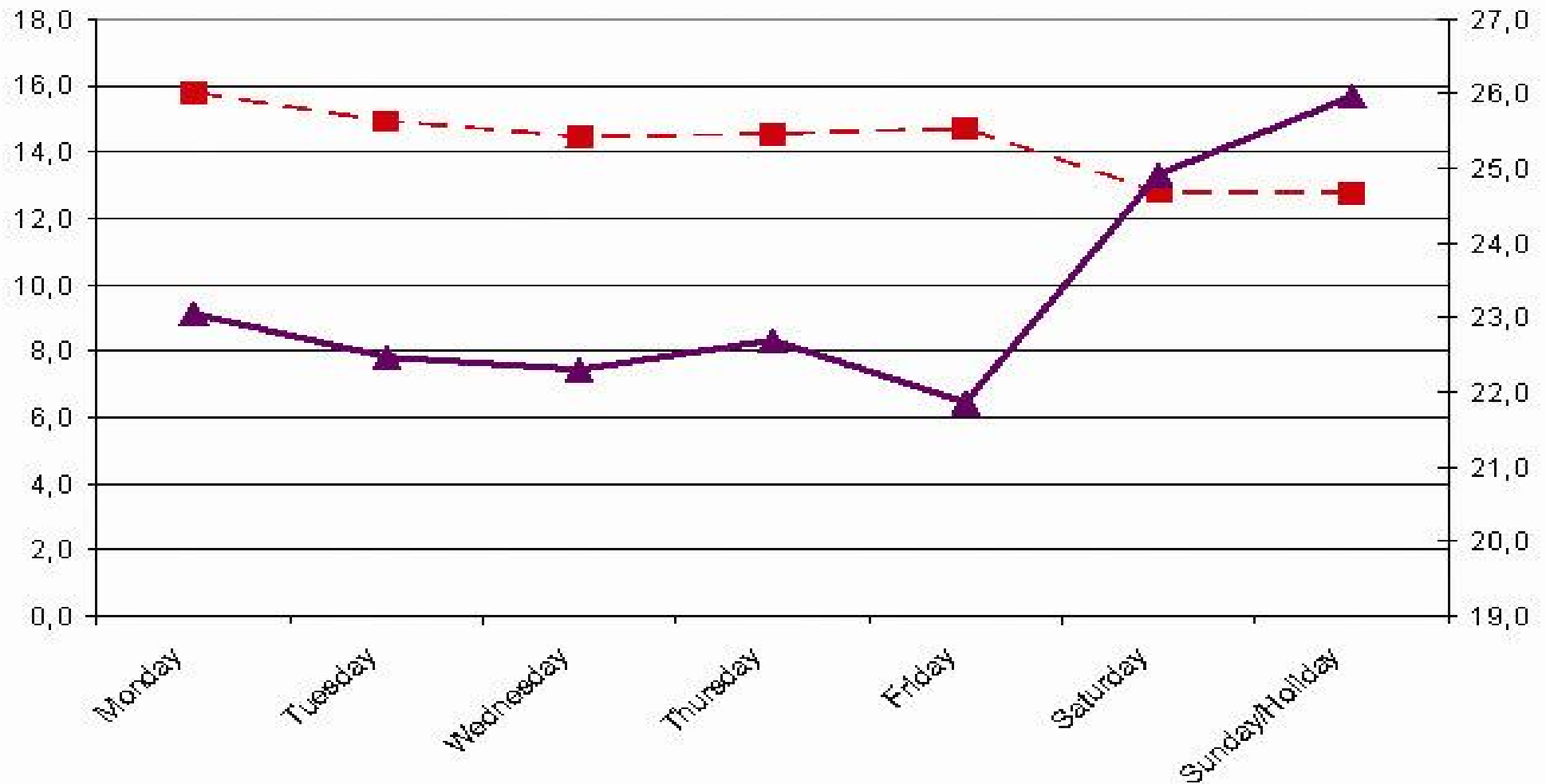
# PULMONARY EMBOLISM

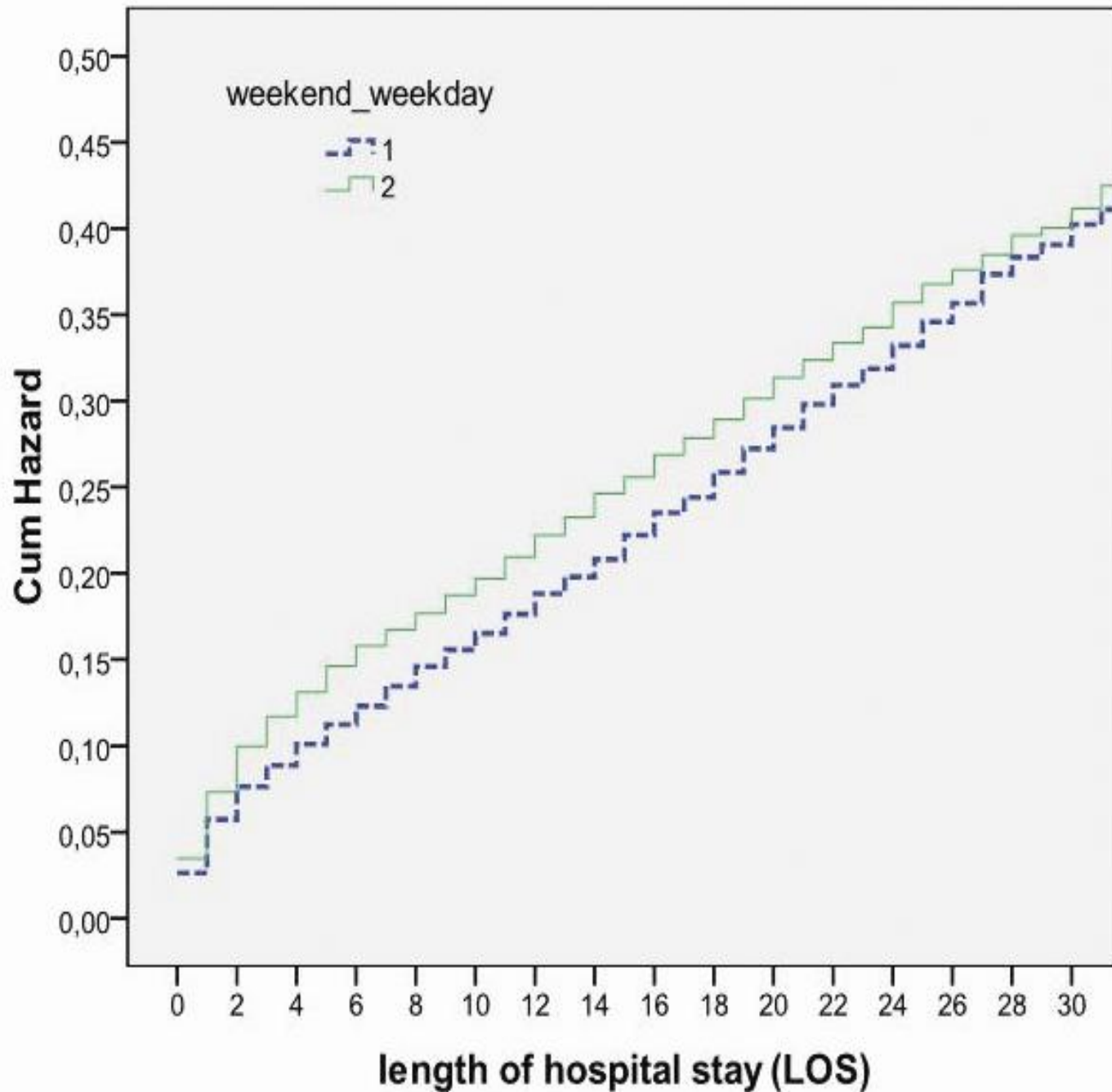
Between 1999 to 2009, the RER database contained records of 26,560 events of PE relative to 24,732 different patients (mean age  $75 \pm 13.8$  yrs).

19,772 patients (74.4%) were admitted on WD and 6788 (25.6%) on WE.

**Thromb Haemost. 2011; 106: 83-9.**

# Day-of-week distribution of pulmonary embolism hospital admissions (percent of events) and distribution of patients dead during hospitalization (% of events)





Survival analysis, performed by using Cox-regression analysis, showed a significantly increased cumulative risk of death during hospitalization for patients admitted on WE compared with those admitted on WD (Chi-square 13.721;  $p < 0.001$ )

# Higher mortality in patients hospitalized for acute aortic rupture or dissection during weekends

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**Background:** The management of acute aortic aneurysm rupture or dissection (AARD) requires specific medical expertise, diagnostic techniques, and therapeutic options, not always available in all hospitals through the entire week. The aim of our study was to evaluate whether an association exists between weekday (WD) or weekend (WE) admission and mortality for patients with AARD.

**Methods:** Based on the database of routinely collected hospital admissions of region of Emilia Romagna (RER) of Italy, we examined the discharge sheets of all patients with AARD (January 1999 -December 2009). The risk of in-hospital death was calculated for admissions at WE compared with the admissions during WD.

**Results:** The analysis considered 4559 events in 4461 patients. AARD admissions were most frequent on Monday (14.7%) and Friday (14.8%) and less frequent on Saturday (12.6%). The percentage of events admitted on Sunday/holiday was 15.0%, whereas the distribution of death rate with respect to day of admission was significantly different ( $\chi^2 = 23.472$ ,  $P < .001$ ) with highest frequency peak on Sunday/holiday (17.4%) and lowest on Tuesday (12.9%). WE admissions were associated with significantly higher in-hospital mortality (43.4%) than WD admissions (36.9%,  $P < .001$ ). Multivariate regression analysis showed that WE admission was an independent risk factor for increased in-hospital mortality odds ratio (OR) 1.318, 95% CE 1.144-1.517,  $P < .001$ ).

**Conclusions:** Our findings show that hospitalization for AARD on WE is associated with a significantly higher mortality rate than hospitalization on WD. Further studies are needed to investigate whether ensuring optimal diagnostic and therapeutic approaches during the entire week might improve the overall survival of patients with AARD. (J Vasc Surg 2012;■■:■■■.)

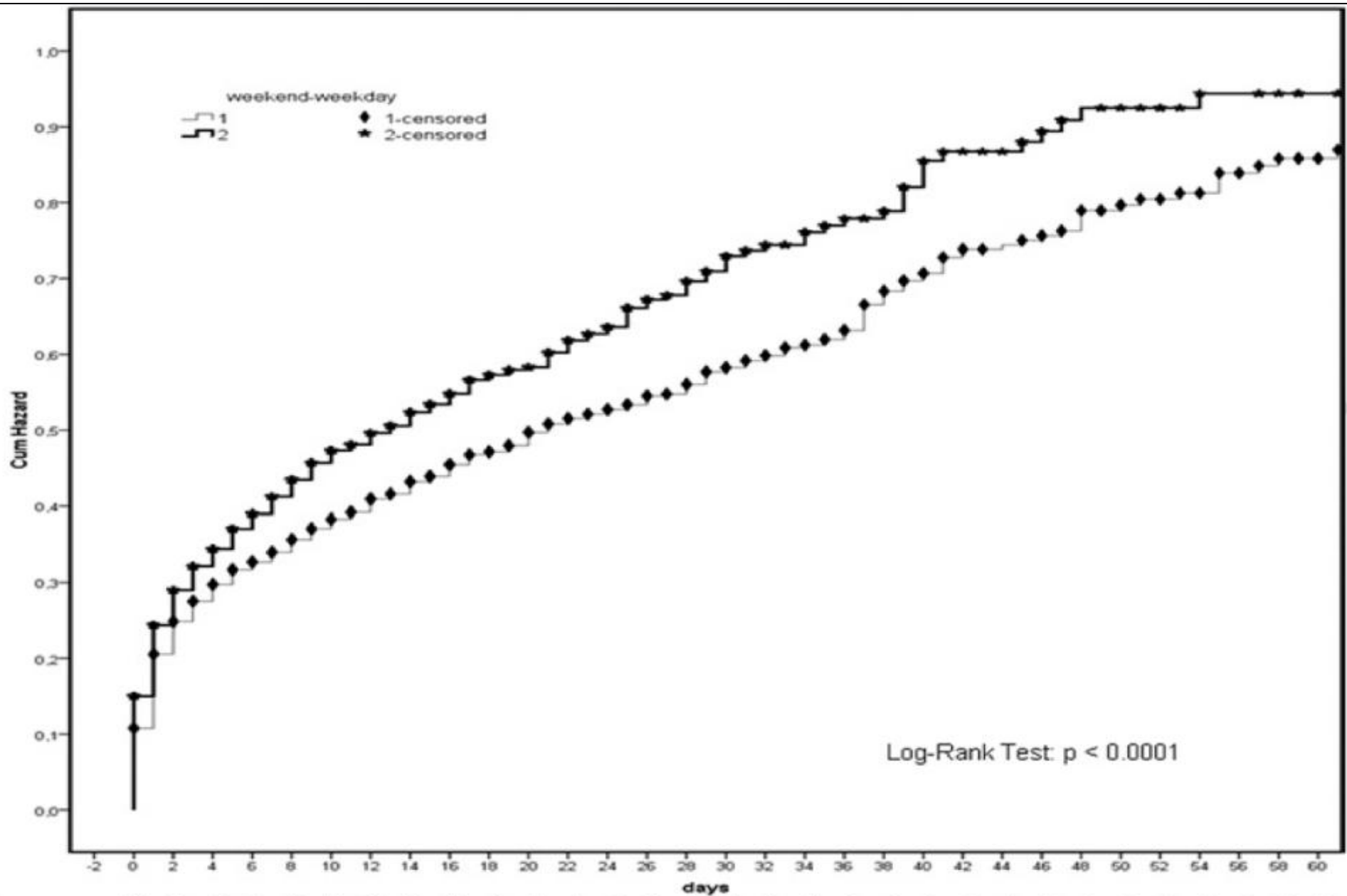
**Table III.** Day-of-week distribution of AARD hospital admissions and subgroups of subjects dead or not during hospitalization

	<i>All cases (n = 4559) (n, % within the group)<sup>a</sup></i>	<i>Dead during hospitalization (n = 1763, 38.7%) (n, % between groups)<sup>b</sup></i>
Monday	668 (14.7)	234 (13.3)
Tuesday	653 (14.3)	228 (12.9)
Wednesday	642 (14.1)	231 (13.1)
Thursday	665 (14.6)	258 (14.6)
Friday	673 (14.8)	265 (15.0)
Saturday	576 (12.6)	240 (13.6)
Sunday/holiday	682 (15.0)	307 (17.4)

AARD, Acute aortic aneurysm rupture or dissection .

<sup>a</sup>within the group, observed compared with expected,  $\chi^2 = 6.106$ ,  $P = .411$ .

<sup>b</sup>between groups dead/not dead,  $\chi^2 = 23.472$ ,  $P < .001$ .



WE	N. of dead patients	271	71	40	31	29	13	11	11	11	4	6	6	7	3	5	4	1	3	1	4	4	0	1	2	1	0	0	1	0	0	0
	N. of remaining patients	1262	954	850	769	685	559	461	397	359	309	278	249	220	182	164	150	132	120	109	104	88	81	79	72	63	60	58	53	51	48	44
WD	N. of dead patients	607	173	94	48	55	32	30	25	25	9	19	7	6	6	11	5	5	3	11	7	6	2	2	2	4	2	1	3	1	1	1
	N. of remaining patients	3297	2583	2331	2140	1884	1547	1311	1121	917	793	691	570	491	436	394	347	308	275	254	228	205	185	170	164	151	139	127	118	110	103	93

\*

\*\*

**Regione ER**

**2000-2010**

**\* P = 0.16**

**\*\* P < 0,001**

## LIMITS OF THE STUDY

- a retrospective studies based on ICD-9 coding
- although we used several techniques to adjust for severity of illness, it is possible that the observed mortality difference between WE and WD admissions may be due to unmeasured, residual confounding
- we had no information on physician-level and system-level factors with a potential impact on the recommended processes of care and outcomes of acute events
- studies on prognosis usually are based on the definition of a certain period to define diagnosis (e.g., 30-day mortality), and not only a rough indicator of in-hospital mortality. Thus, it is possible that some patients discharged alive from hospital could have successively died at home
- the present studies does not account for deaths declared before hospital admission. As these deaths may be more common on WE than on WD, the present study may have underestimated the difference in mortality

## **ADVANTAGES OF THE STUDY**

- the large number of consecutive patients hospitalized, and the long period analysis
- either the possible influence due to the difference of province or type (teaching/non teaching) and size (number of beds per hospital site) of hospital have been investigated. Thus, these results seem to be well representative of the real-life clinical management of patients hospitalized for acute illness

## POSSIBLE EXPLANATIONS

- on WE, the number of admissions does not diminish proportionately to the number of physicians working on the wards. Medical activity is very difficult to maintain adequately with uniform quality of care throughout the week and is reduced during WE.
- the number of physicians working on a WE is <30% of the WE levels (normally just the physicians on call).
- fewer medical providers and professional staff (including nurses) work in hospitals on WE than on WD; moreover, those who do work on WE could have less clinical.
- General Practitioners (GPs) work from Monday to Friday, but are not available during WE. During holidays and WE GPs are substituted by dedicated weekend doctors on-call, who have less experience and knowledge about patients
- differences in clinical outcome by day of admission could reflect differences in the clinical characteristics of patients themselves, as shown, for example, for acute coronary syndromes

## OVERCROWDING: SOLUZIONI

### Protocolli Operativi/Percorsi Predefiniti

Protocollo SCA

Protocollo "Stroke"

Protocollo Meningite

Protocollo Emorragie Digestive

Protocollo Trauma Maggiore/Golden Hour

Protocollo Trauma Cranico

Protocollo Dolore Toracico

Protocollo Sincope

Protocollo Asma Bronchiale/Polmoniti



Richiedono massima  
coordinazione con  
l'emergenza territoriale

It's the weekend



I don't know about you,  
But I am ready for the.....

**WEEKEND!!**