Azienda Ospedaliera
Universitaria di Ferrara
Dipartimento Medico

OSPEDALIZZAZIONE PER SCOMPENSO CARDIACO: ESISTONO PERIODI DI MAGGIOR RISCHIO?

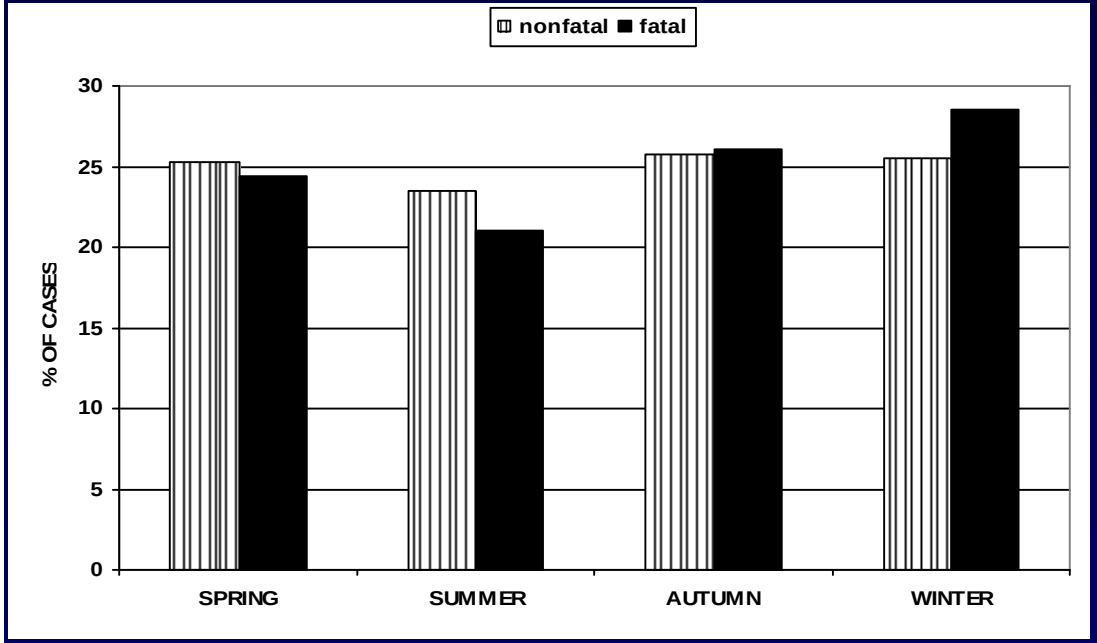
Massimo Gallerani , Roberto Manfredini

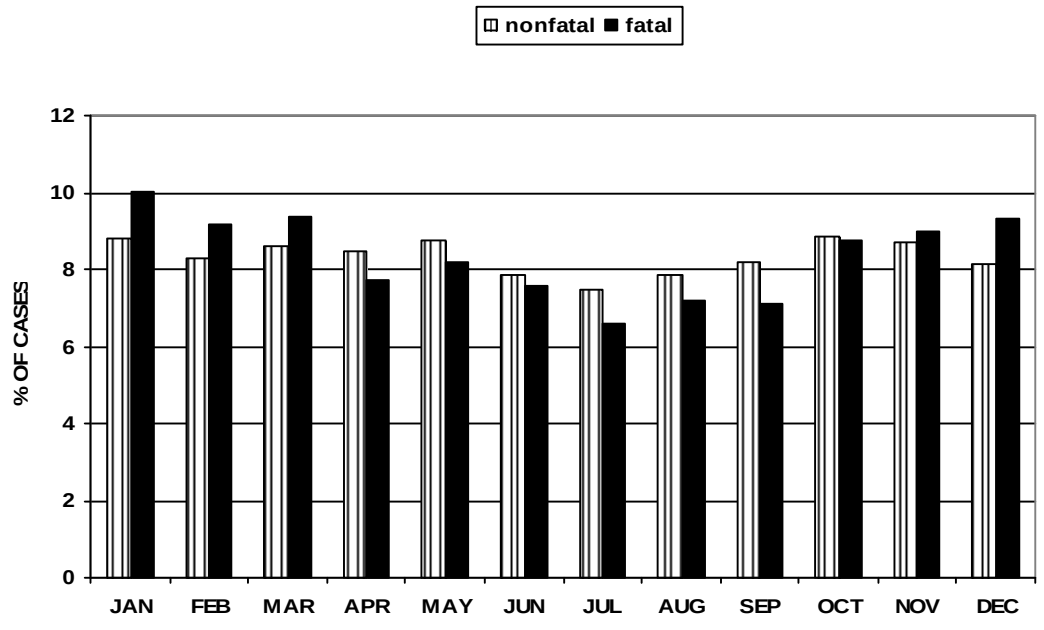
28 Aprile 2011

Seasonal and weekly patterns of hospital admissions for nonfatal and fatal myocardial infarction ☆

Roberto Manfredini MD[a,b,*], Fabio Manfredini MD[c], Benedetta Boari MD[d], Elisabetta Bergami MD[d], Elisa Mari MD[d], Susanna Gamberini MD[b], Raffaella Salmi MD[d], Massimo Gallerani MD[d]

Regione Emilia Romagna, Italy, 1998-2006 (n = 40,386)



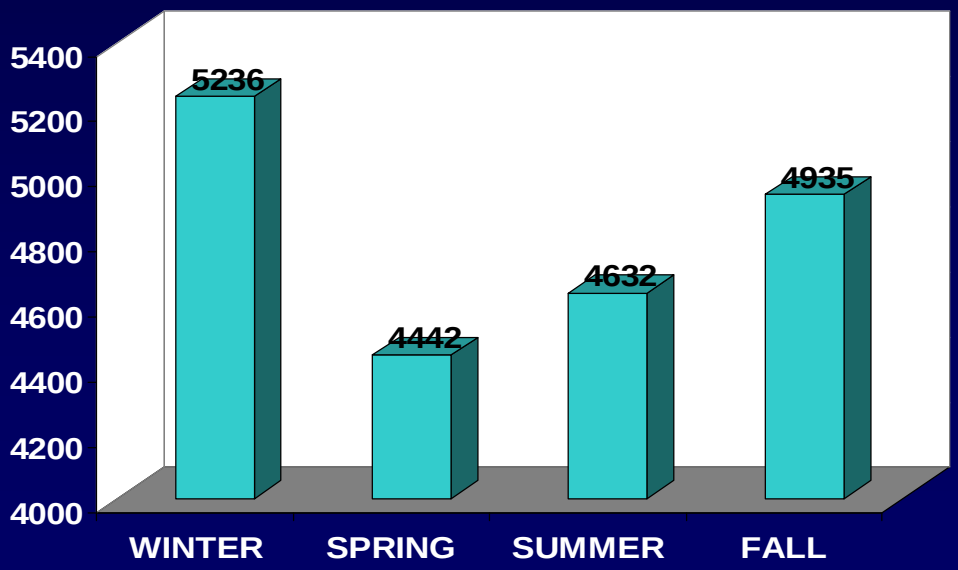


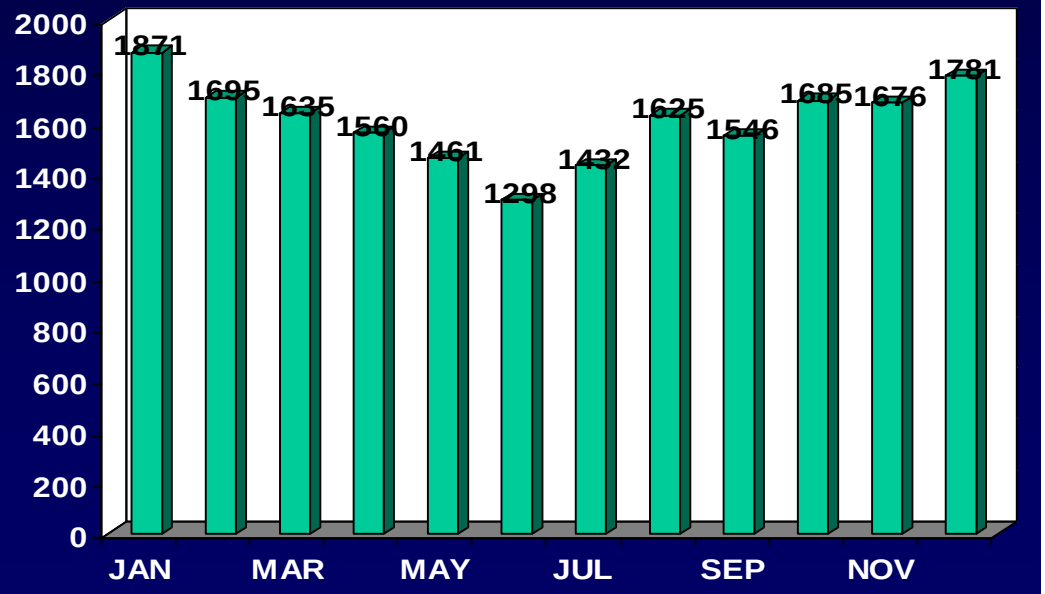
Manfredini et al, *Am J Emerg Med 2009*

SEASONAL VARIATION IN OCCURRENCE OF PULMONARY EMBOLISM: ANALYSIS OF THE DATABASE OF THE EMILIA-ROMAGNA REGION, ITALY

Massimo Gallerani,[1] Benedetta Boari,[1] Michael H. Smolensky,[2] Raffaella Salmi,[1] Davide Fabbri,[3] Edgardo Contato,[4] and Roberto Manfredini[5]

Regione Emilia-Romagna, Italy, 1998-2005 (n = 19,245)



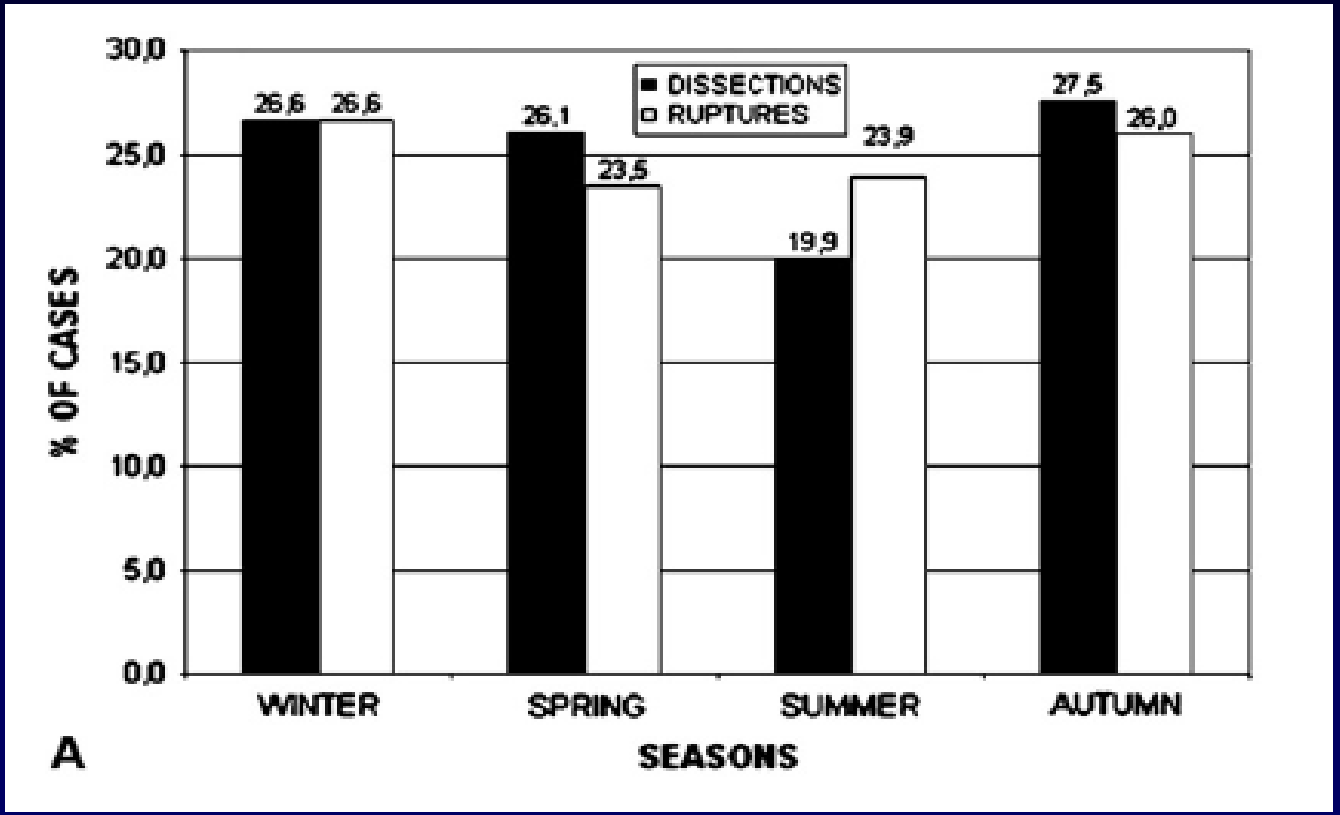


Chronobiol Int 2007

Seasonal variation in occurrence of aortic diseases: The database of hospital discharge data of the Emilia–Romagna region, Italy

Roberto Manfredini, MD,[a] Benedetta Boari, MD,[b] Fabio Manfredini, MD,[c] Raffaella Salmi, MD,[b] Eduardo Bossone, MD,[d] Davide Fabbri, MD,[e] Edgardo Contato, MD,[f] Francesco Mascoli, MD,[g] and Massimo Gallerani, MD,[b] Ferrara and Milan, Italy

Regione Emilia-Romagna, Italy, 2000-2006 (n = 4,615)



Manfredini et al, *J Thorac Cardiovasc Surg* 2008

Seasonal and weekly patterns of hospital admissions for nonfatal and fatal myocardial infarction☆

Roberto Manfredini MD[a,b,*], Fabio Manfredini MD[c], Benedetta Boari MD[d], Elisabetta Bergami MD[d], Elisa Mari MD[d], Susanna Gamberini MD[b], Raffaella Salmi MD[d], Massimo Gallerani MD[d]

American Journal of Emergency Medicine (2009) 27, 1097–1103

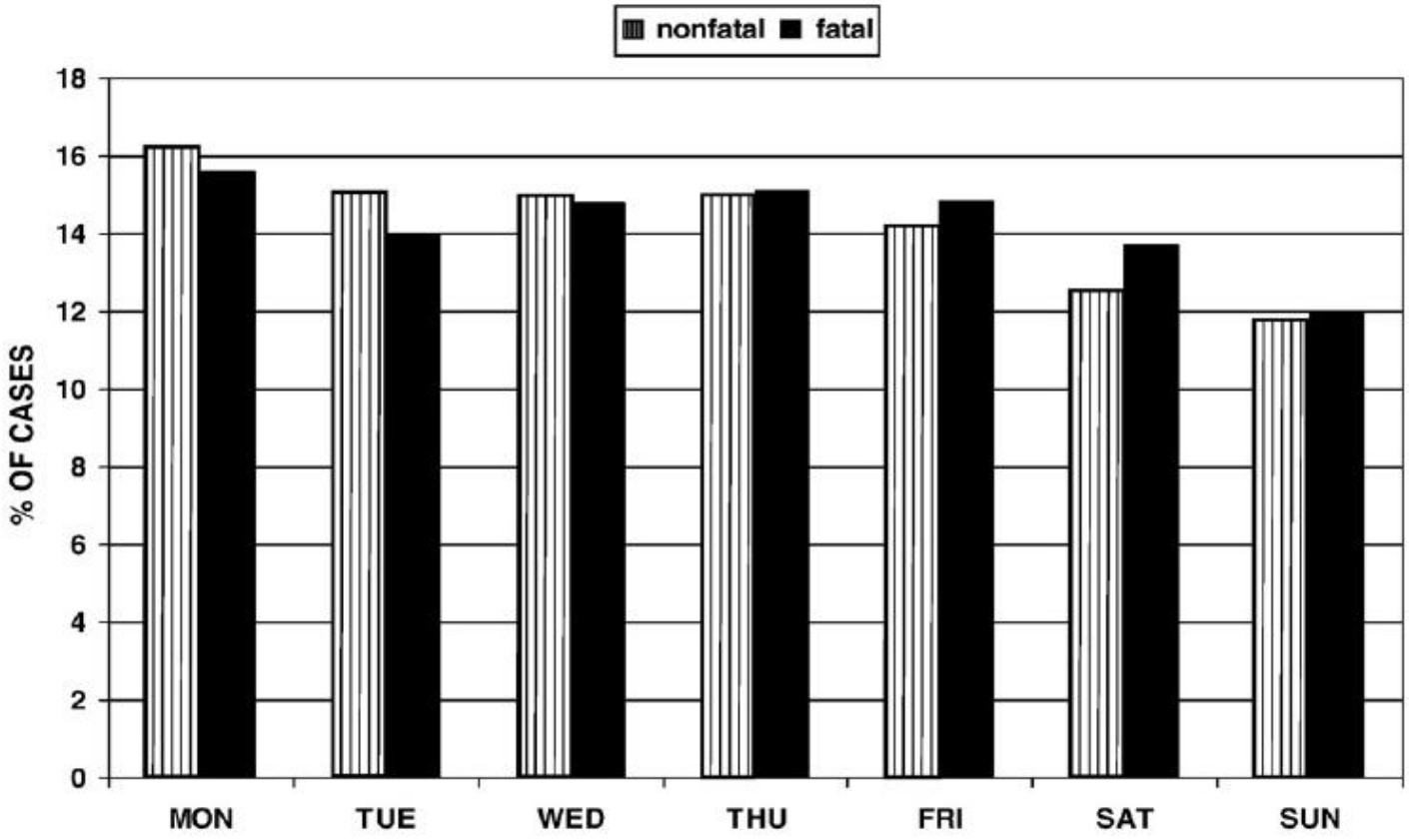
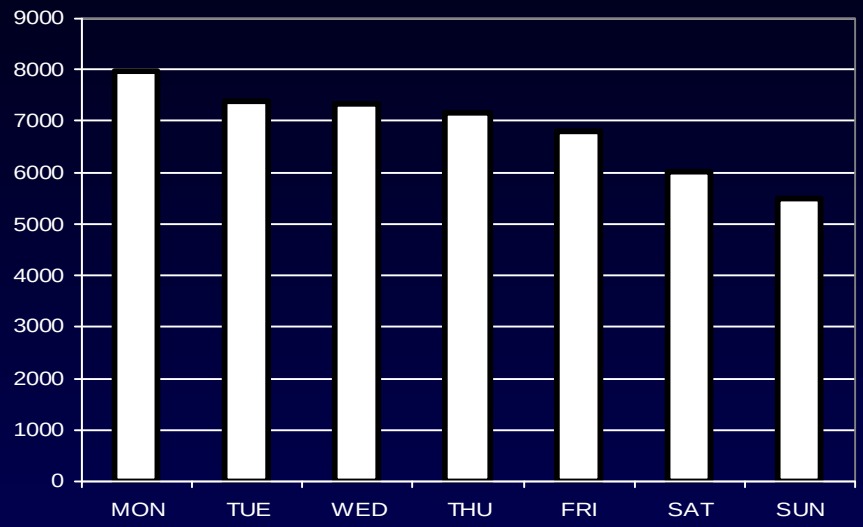


Fig. 3 Weekly distribution of myocardial infarction: nonfatal and fatal events.

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 ($p < 0.001$).

Stroke ischemico

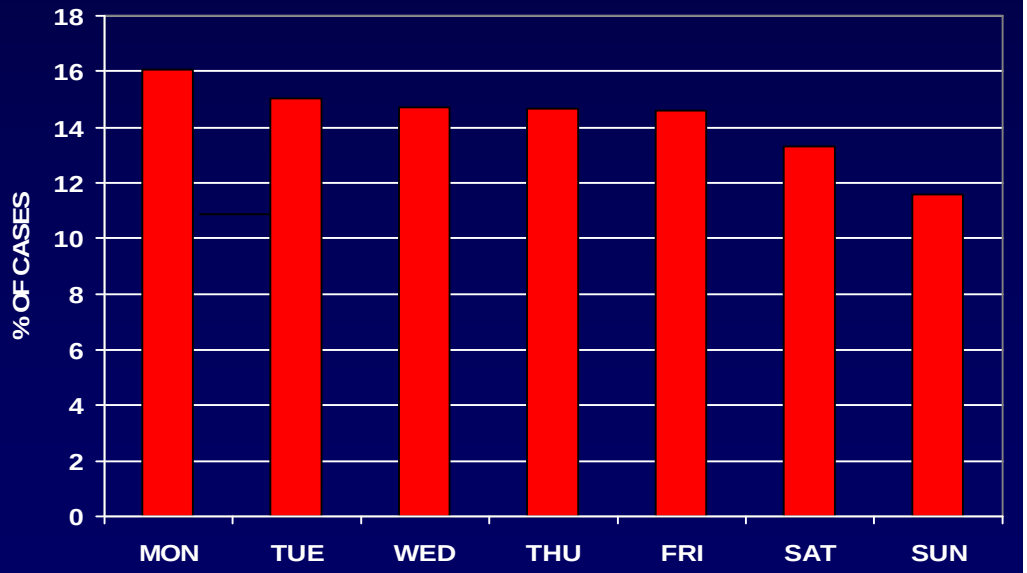
Regione Emilia-Romagna, Italy, 1998-2006 (n = 56,453)



Manfredini et al, *J Am Geriatr Soc 2009*

Attacco ischemico transitorio (TIA)

Regione Emilia-Romagna, Italy, 1998-2006 (n = 43,642)



Manfredini et al, *Clin Appl Thromb Hemost* 2010

Day of Admission and Clinical Outcomes for Patients Hospitalized for Heart Failure

Findings From the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure (OPTIMIZE-HF)

Gregg C. Fonarow, MD; William T. Abraham, MD; Nancy M. Albert, RN, PhD; Wendy Gattis Stough, PharmD; Mihai Gheorghiade, MD; Barry H. Greenberg, MD; Christopher M. O'Connor, MD; Eduardo Nunez, MD; Clyde W. Yancy, MD; James B. Young, MD

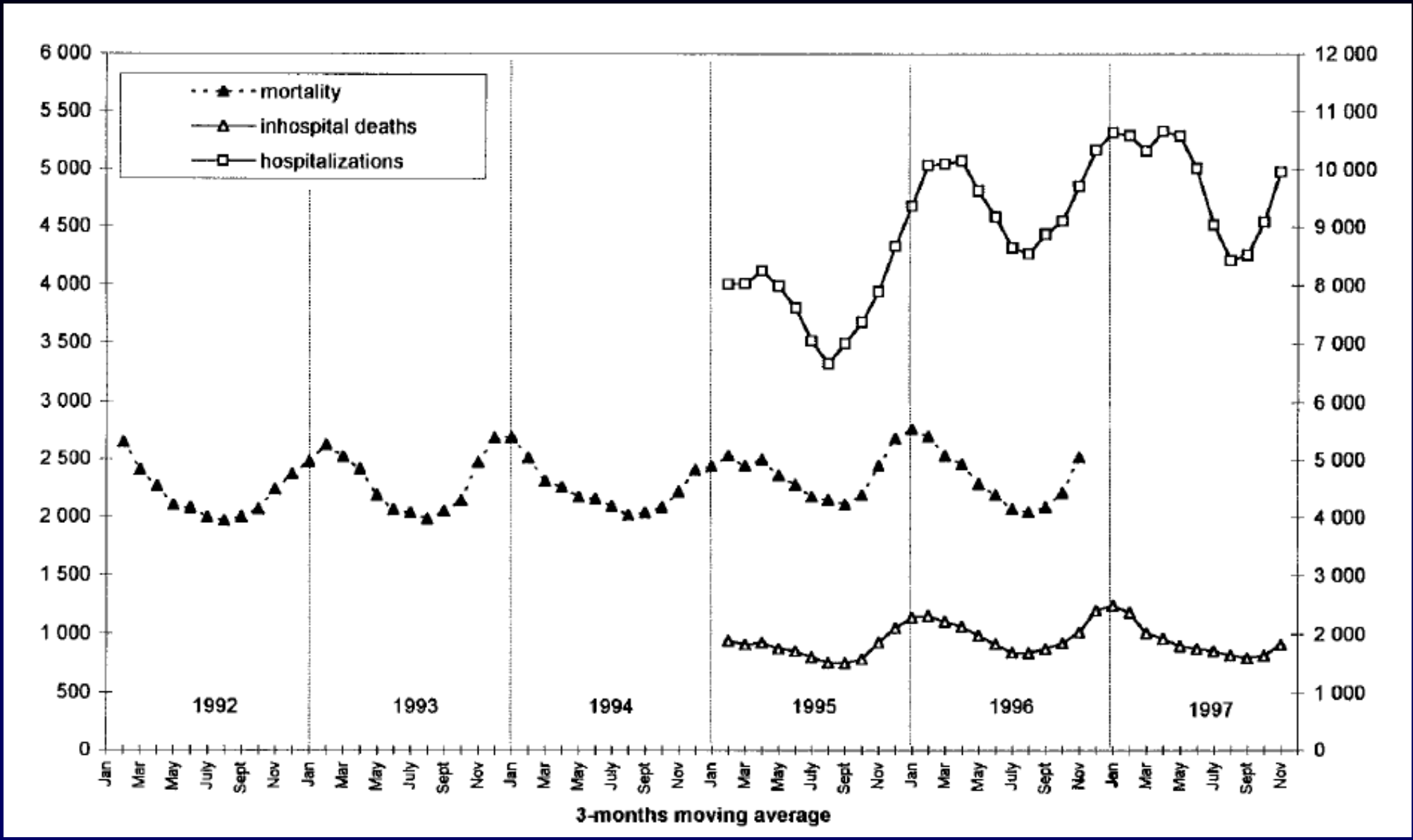
Background—Differences in hospital staffing may influence outcomes for patients with acute conditions, including heart failure (HF), depending on which day of the week the patients are admitted. This study examined the relationship between the day of the week patients are hospitalized for HF and death rate, length of stay (LOS), and rehospitalization rate.

Methods and Results—A total of 259 US hospitals participating in the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure (OPTIMIZE-HF) submitted data on 48 612 patients with HF. Sixty- to 90-day postdischarge follow-up data were collected prospectively in a prespecified 10% sample. We analyzed day of admission and discharge, demographic, medical history, medication use, laboratory, and in-hospital procedure data for their association with hospital LOS and death rate. Patient characteristics were similar for weekday and weekend presentation. LOS was a median of 4.0 days and a mean of 5.7±5.7 days; in-hospital death rate was 3.8%. In-hospital and postdischarge risk of death were similar for each day of the week in the hospital and follow-up cohorts, respectively. LOS, however, was significantly influenced by day of admission, even after adjustment for other LOS risk factors. The shortest LOS by admission day of the week was Tuesday (5.39 days), and the longest was Friday (5.88 days; $P<0.001$).

Conclusions—No differences in death rate by day of admission or discharge for HF hospitalizations were evident. Hospitalizations for HF on Thursday and Friday were associated with prolonged LOS. Understanding the factors responsible for the increased LOS and potential adjustments in staffing to facilitate weekend discharges may improve the efficiency of HF hospital care. (***Circ Heart Fail.* 2008;1:50-57.**)

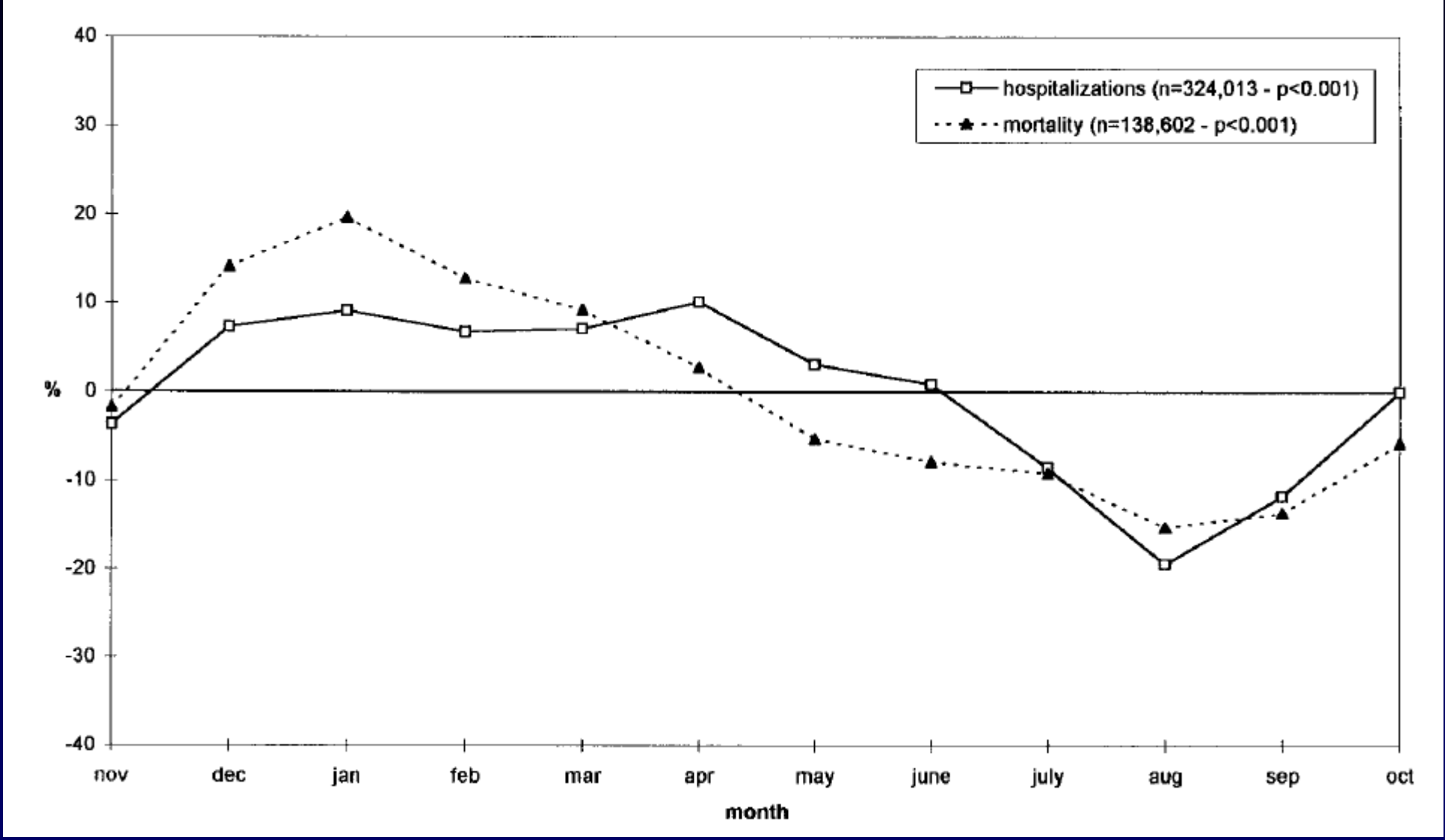
Seasonal Variation in Chronic Heart Failure Hospitalizations and Mortality in France

Boulayet al. Circulation 1999



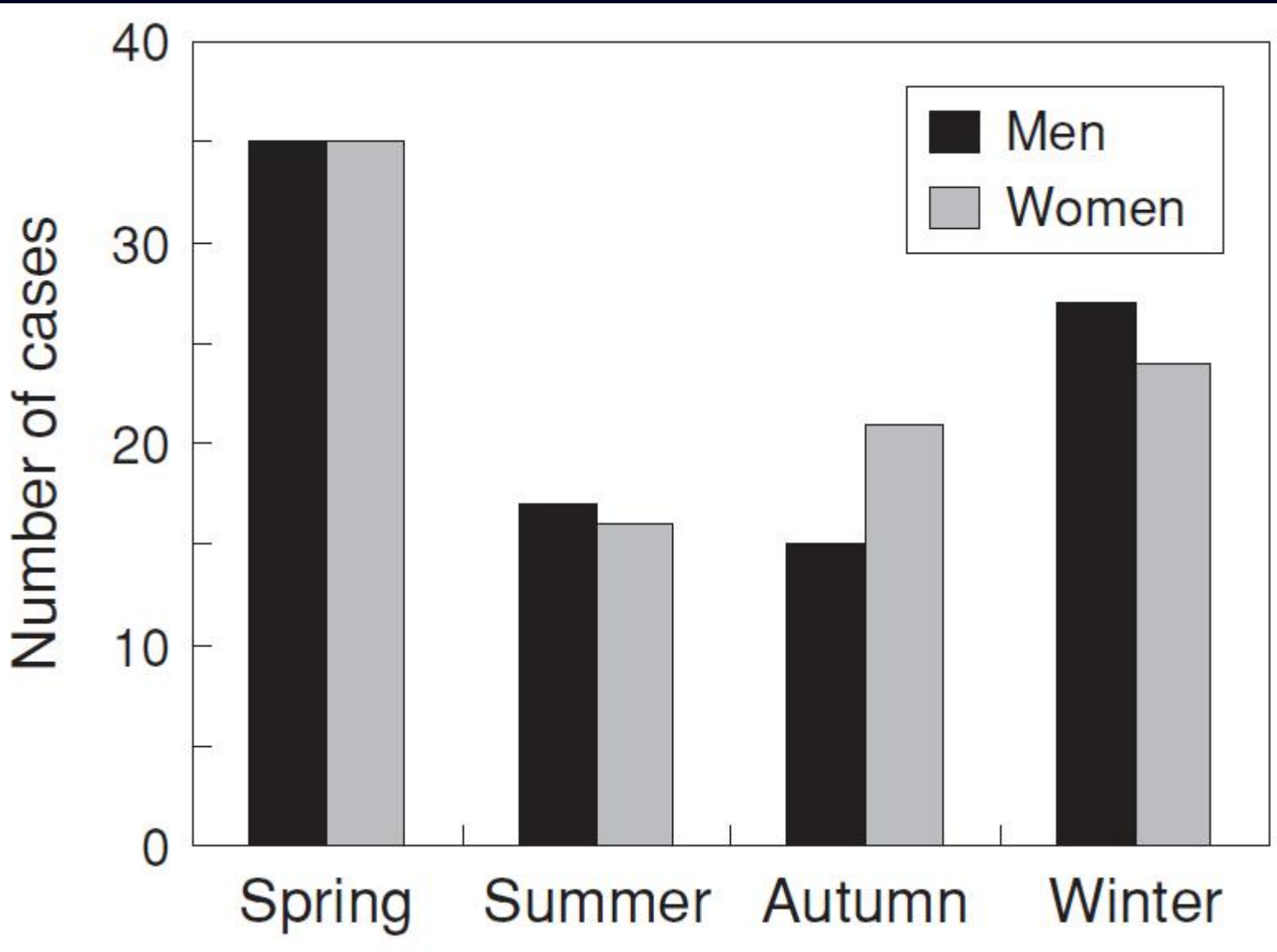
Monthly moving average of mortality (total population 1992 through 1996), hospitalizations (public hospitals 1995 through 1997), and in-hospital deaths (public hospitals 1995 through 1997) for chronic heart failure.

Seasonal variations of monthly mortality (total population 1992 through 1996 combined) and hospitalizations (public hospitals 1995 through 1997 combined) for chronic heart failure.



Boulayet al. Circulation 1999

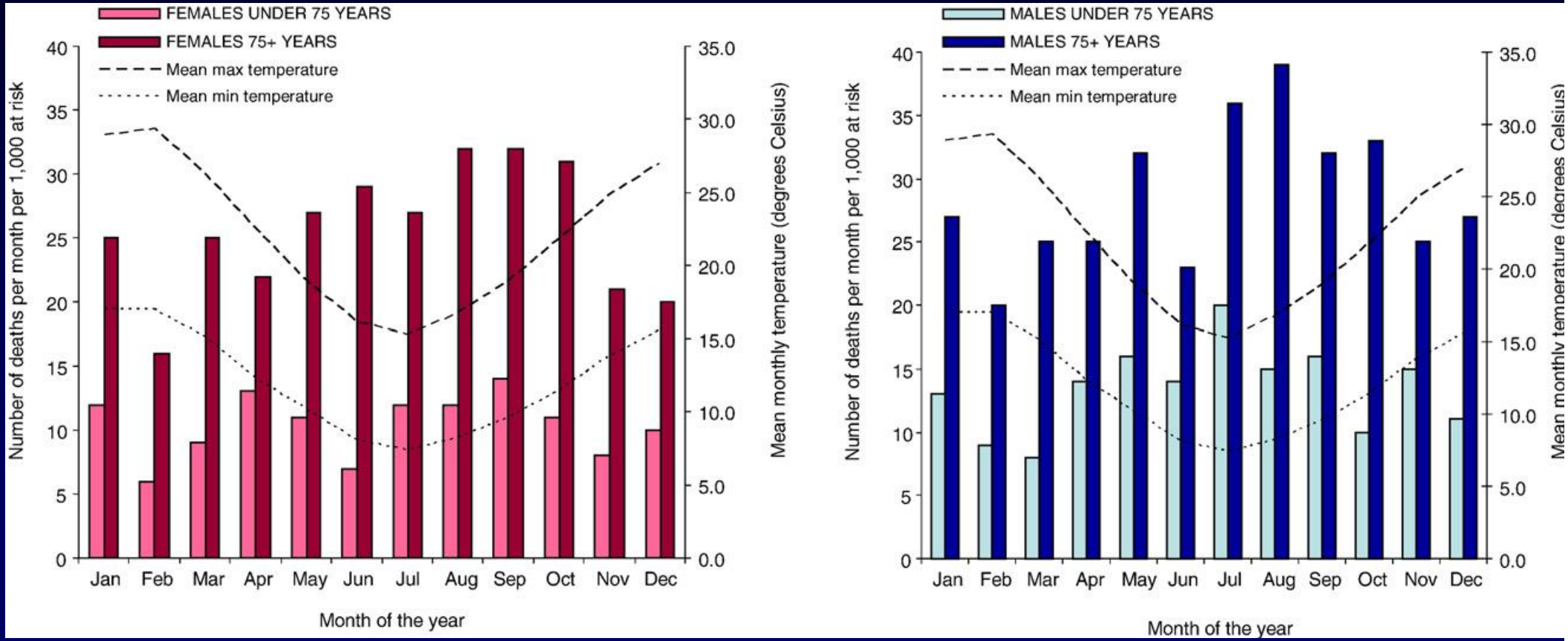
A Community Based Epidemiological and Clinical Study of Hospitalization of Patients With Congestive Heart Failure in Northern Iwate, Japan



Seasonal variation in the accumulated number of hospitalizations for heart failure during the 3-year study period.

Ogawa et al. Circ J 2007; **71:** 455 –459

Hot summers and heart failure: Seasonal variations in morbidity and mortality in Australian heart failure patients (1994–2005)



All-cause mortality rate according to sex and months of the year. Graphs depict mean high and low temperatures for the month

S.C. Inglis et al. / European Journal of Heart Failure 10 (2008) 540–549

Obiettivo dello studio

Valutare quali sono le eventuali variabilità temporali per i ricoveri per scompenso cardiaco congestizio

Materiali e Metodi

Sono state utilizzte le SDO dei pazienti ricoverati per scompenso cardiaco nella Regione Emilia Romagna Gennaio 1999-Dicembre 2009.

The discharge hospital sheet contains information of each subject: surname and name, sex, date of birth, date and department of hospital admission and discharge, main and up to 15 accessory discharge diagnoses, and most important diagnostic procedures, based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM).

We considered the ICD-9-CM codes used for identifying patients with heart failure were 420 to 429, as principal diagnosis or any diagnosis, and in particular:

We considered the ICD-9-CM codes used for identifying patients with heart failure were 420 to 429, as principal diagnosis or any diagnosis, and in particular:

420-429	OTHER FORMS OF HEART DISEASE
428	Heart failure
428.0	Congestive heart failure, unspecified
428.1	Left heart failure 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

During the analyzed period, the hospital database contained the records of 15,954 patients (mean age 77,7 ± 10,5 years) with the ICD-9-CM codes of HF (420-429). Of these patients, 7733 were male (48.5%) and 8221 were females (51.5%).

The mean ± SD age was 76.8 + 11.5 years (75.9 ± 10.3 and 79.4 ± 10.4 years for males and females, respectively, t = 15,514, p < 0.001).

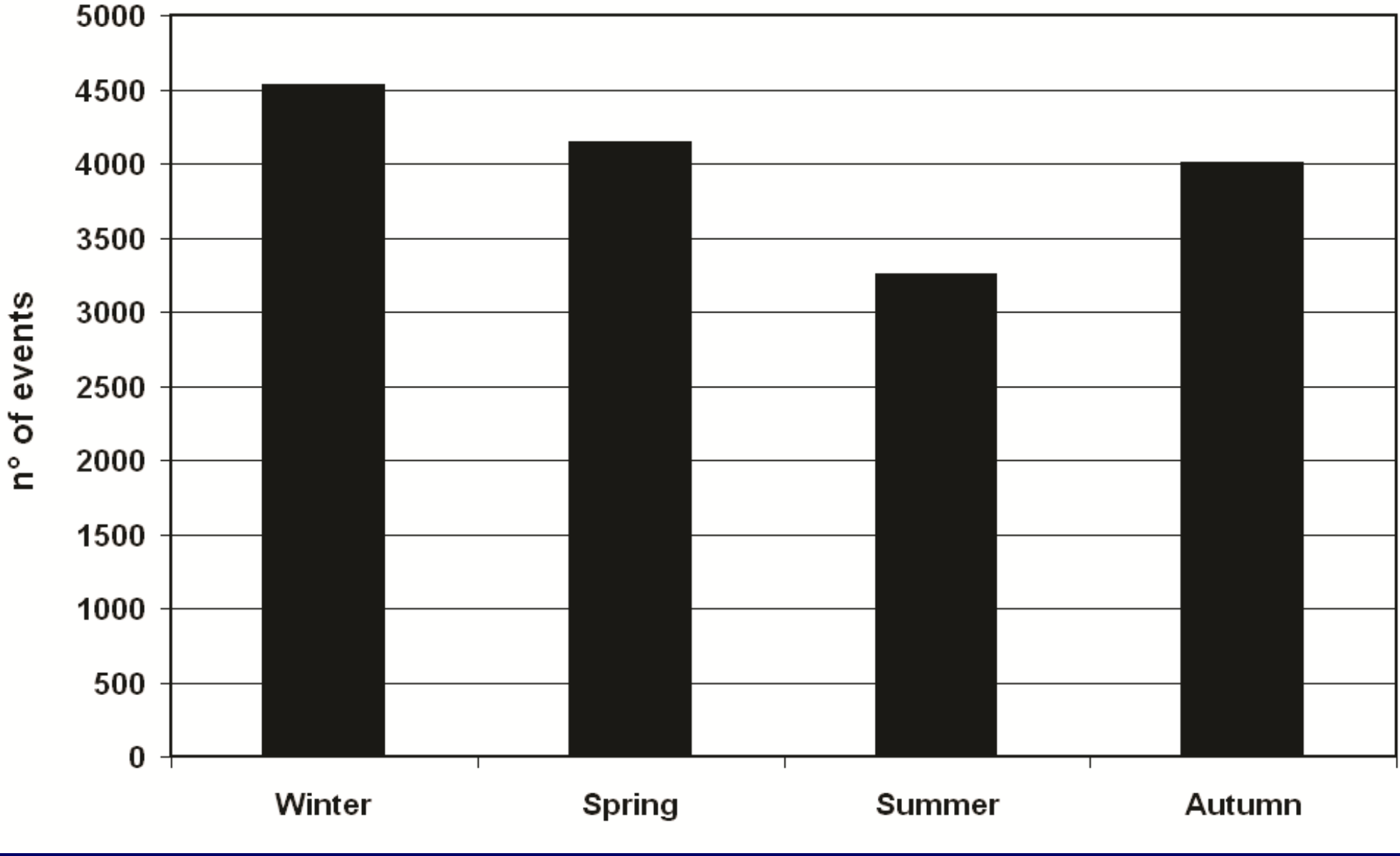
Clinical Investigation

Seasonal Variation in Heart Failure Hospitalization

Massimo Gallerani, MD; Benedetta Boari, MD; Fabio Manfredini, MD; Roberto Manfredini, MD

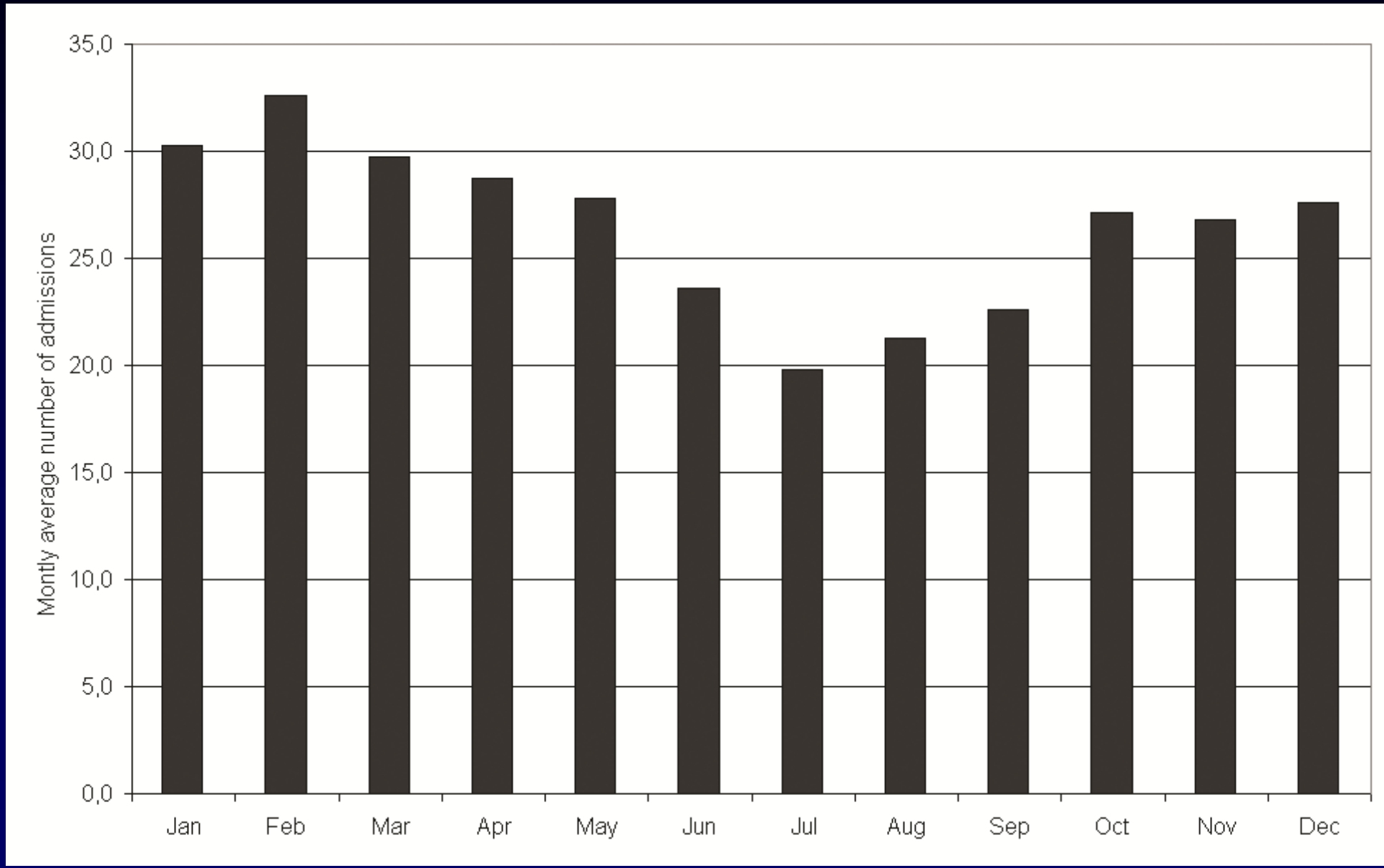
Department of Internal Medicine (Gallerani, Boari), Vascular Diseases Center (F. Manfredini, R. Manfredini), Clinica Medica (R. Manfredini), Hospital of Ferrara, Italy; Department of Internal Medicine (R. Manfredini), Hospital of the Delta, Azienda USL, Ferrara, Italy

Clin. Cardiol. 2011; 34


5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
n° of events
Winter
Spring
Summer
Autumn

Seasonal variation of Heart Failure Hospital Admission for Total Subjects an anlyzed Subgroups

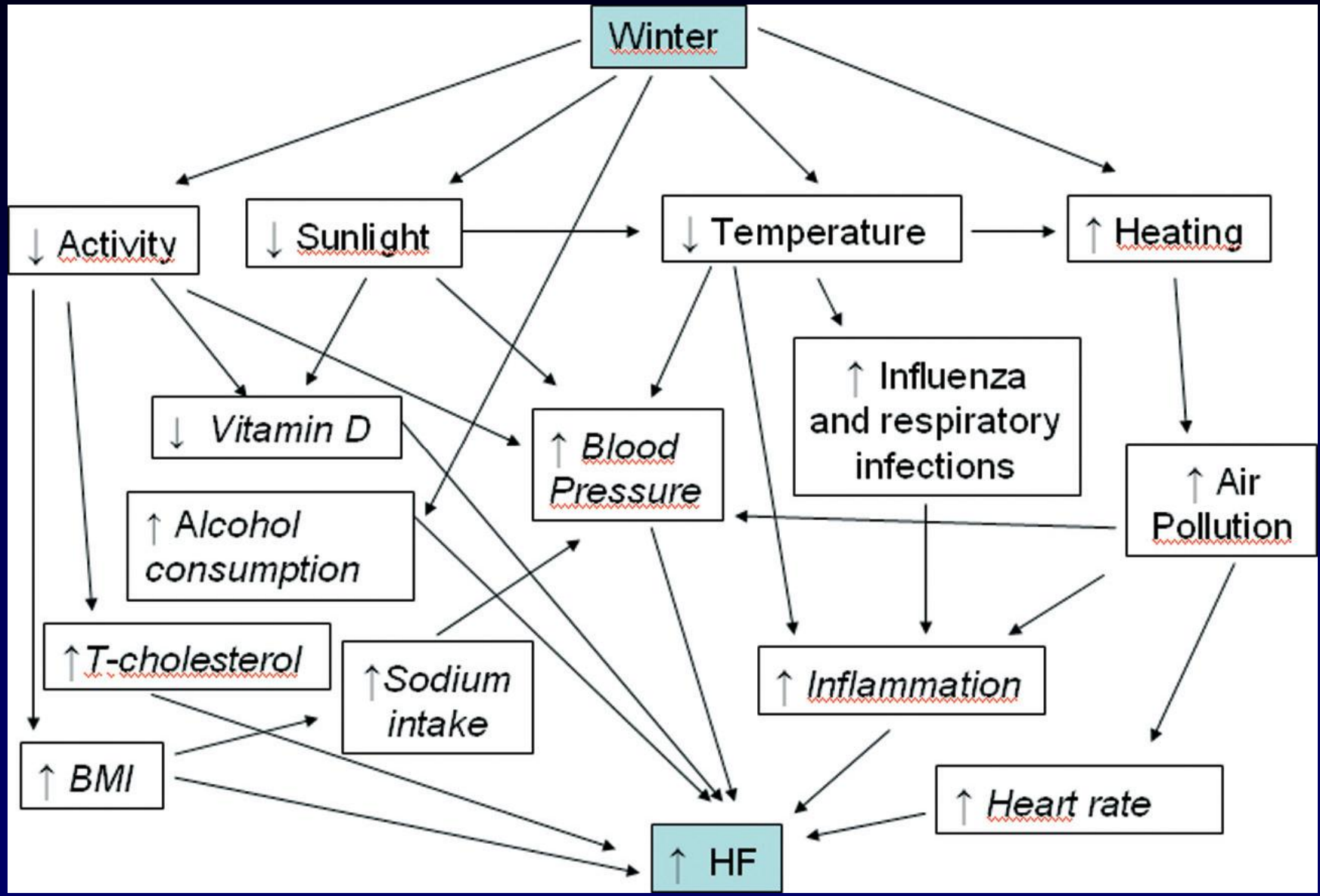
	Winter (%)	Spring (%)	Summer (%)	Autumn (%)	χ^2 Test for Nonuniformity	*P*
All cases (n = 15 954)	4536 (28.4)	4145 (26.0)	3261 (20.4)	4012 (25.1)	214,16	<0.001
Males (n = 7733)	2235 (28.9)	2034 (26.3)	1587 (20.5)	1877 (24.3)	116,01	<0.001
Females (n = 8221)	2301 (28.0)	2111 (25.7)	1674 (20.4)	2135 (26.0)	104,73	<0.001
Age < 60 yrs (n = 894)	263 (29.4)	236 (26.4)	170 (19.0)	225 (25.2)	20,55	<0.001
Age 60–69 yr (n = 2042)	570 (27.9)	513 (25.1)	429 (21.0)	530 (26.0)	20,73	<0.001
Age 70–79 yr (n = 5269)	1532 (29.1)	1352 (25,7)	1088 (20.6)	1297 (24.6)	76,15	<0.001
Age > 79 yrs (n = 7749)	2171 (28.0)	2044 (26.4)	1574 (20.3)	1960 (25.3)	102,48	<0.001
Diabetes (n = 3061)	870 (28.4)	773 (25.3)	603 (19.7)	815 (26.6)	52,07	<0.001
No diabetes (n = 12 893)	3666 (28.4)	3372 (26.2)	2658 (20.6)	3197 (24.8)	167,03	<0.001
Hypertension (n = 5464)	1560 (28.6)	1459 (26.7)	1090 (19.9)	1355 (24.8)	89,74	<0.001
No hypertension (n = 10 490)	2976 (28.4)	2686 (25.6)	2171 (20.7)	2657 (25.3)	127,4	<0.001
Dead during hospitalization (n = 2129)	627 (29.5)	517(24.3)	450 (21.1)	535 (25.1)	30,04	<0.001
Discharged alive (n = 12 558)	3544 (28.2)	3310 (26.4)	2541 (20.2)	3163 (25.2)	175,68	<0.001
Transferred to another department (n = 1267)	365 (28.8)	318 (25.1)	270 (21.3)	314 (24.8)	14,31	0.003
First diagnosis code ICD-9 428 (n = 7278)	2087 (28.7)	1936 (26.6)	1388 (19.1)	1867 (25.7)	150,4	<0.001
No first code ICD-9 428 (n = 8676)	2449 (28.2)	2209 (25.5)	1873 (21.6)	2145 (24.7)	77,54	<0.001


35,0
30,0
25,0
20,0
15,0
10,0
5,0
0,0
Montly average number of admissions
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

	No.	Amplitude ± SE	Acrophase (peak), d	P
Total	15 954	219.20 ± 27.91	24, January	<0.001
Females	8221	108.48 ± 16.43	17, January	<0.001
Males	7733	112.18 ± 13.50	30, January	<0.001
Age < 60 yr	894	14.98 ± 4.33	30, January	0.022
Age 60–69 yr	2042	27.14 ± 7.74	8, January	0.021
Age 70–79 yr	5269	78.86 ± 12.15	27, January	<0.001
Age > 79 yr	7749	104.01 ± 13.55	23, January	<0.001
Diabetes	3061	47.94 ± 5.59	16, January	<0.001
No diabetes	12 893	171.83 ± 24.32	26, January	<0.001
Hypertension	5464	81.45 ± 10.18	27, January	<0.001
No hypertension	10 490	137.99 ± 20.31	22, January	<0.001
Dead during hospitalization	2129	33.98 ± 5.19	11, January	<0.001
Discharged alive	12 558	170.64 ± 25.56	28, January	<0.001
Transferred to another department	1267	16.60 ± 4.84	6, January	<0.001

Chronobiologic Analysis of Annual Frequency of Hospital Discharges for Heart Failure

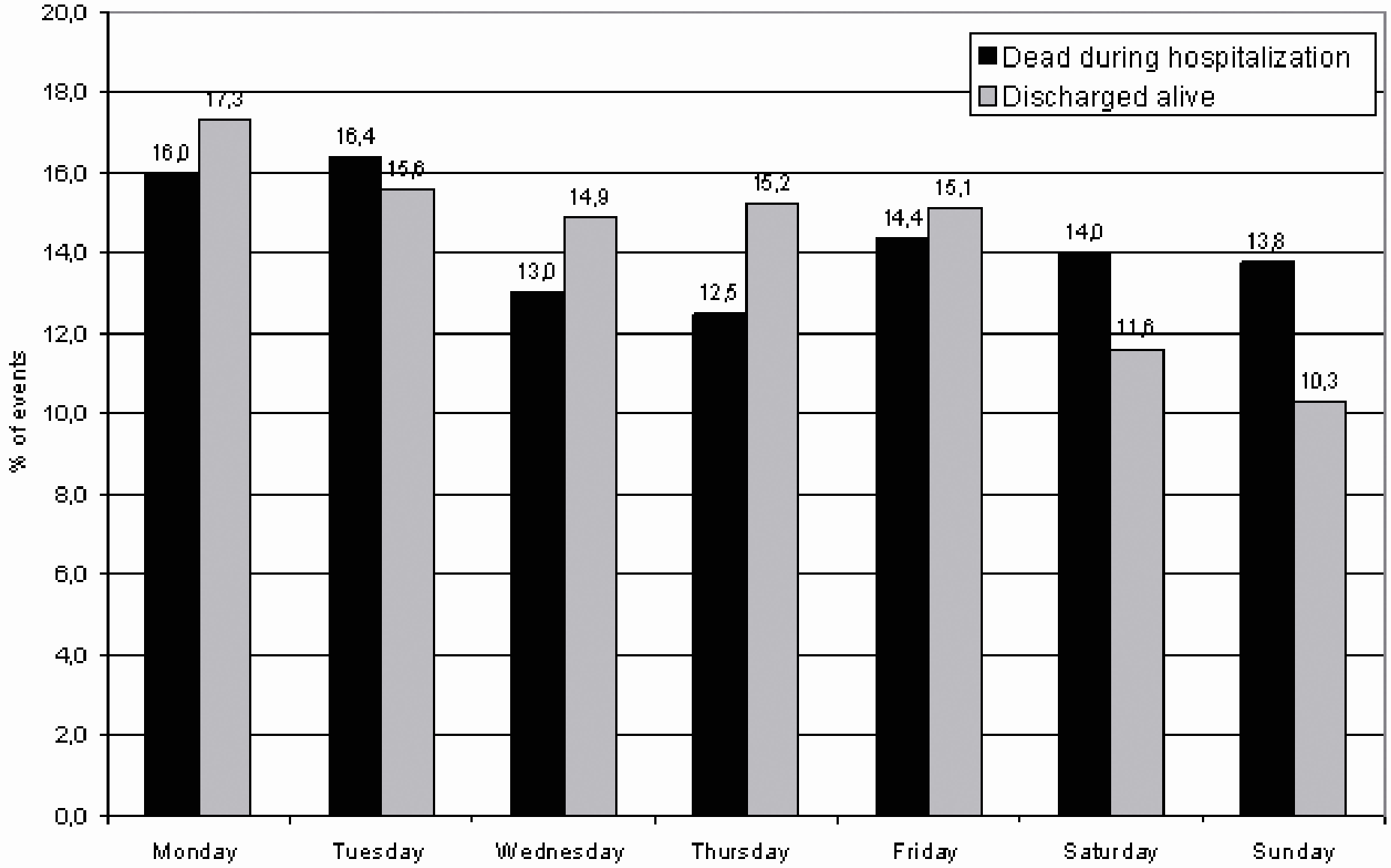
Hypotheses about pathways between winter and heart failure (HF)



Weekend versus weekday hospital admissions for acute heart failure

Massimo Gallerani [a,*], Benedetta Boari [a], Fabio Manfredini [b], Elisa Mari [a], Cinzia Maraldi [a], Roberto Manfredini [c]

[a] *Department of Internal Medicine, Hospital of Ferrara, Italy*
[b] *Vascular Diseases Center, University of Ferrara, Italy*
[c] *Department of Clinical and Experimental Medicine, Clinica Medica and Vascular Diseases Center, University of Ferrara, Italy*


20,0
18,0
16,0
14,0
12,0
10,0
8,0
6,0
4,0
2,0
0,0
% of events
Dead during hospitalization
Discharged alive
16,0
17,3
16,4
15,6
13,0
14,9
12,5
15,2
14,4
15,1
14,0
11,6
13,8
10,3
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

Admissions	Monday	Saturday	Sunday	Chi-square^	p
All cases (n= 9657)	1623 (16.8%)	1150 (11.9%)	1061 (11.0%)	230.68	<0.001

Table 1
Day-of-week d

Admissions									p
All cases (n=									<0.001
Males (n=4									0.260
Females (n=5105; 52.8%)	854 (16.7%)	791 (15.5%)	758 (14.8%)	764 (15%)	743 (14.6%)	617 (12.1%)	578 (11.3%)		
Age <60 yrs (n=430; 4.5%)	74 (17.2%)	55 (12.8%)	70 (16.3%)	62 (14.4%)	73 (17.0%)	47 (10.9%)	49 (11.4%)	23.007	0.190
Age 60–69 yrs (n=1193; 12.4%)	197 (16.5%)	184 (15.4%)	176 (14.8%)	177 (14.8%)	204 (17.1%)	147 (12.3%)	108 (9.1%)		
Age 70–79 yrs (n=3058; 31.7%)	513 (16.8%)	489 (16.0%)	463 (15.1%)	456 (14.9%)	479 (15.7%)	346 (11.3%)	312 (10.2%)		
Age >79 yrs (n=4976; 51.5%)	839 (16.9%)	778 (15.6%)	683 (13.7%)	745 (15.0%)	729 (14.7%)	610 (12.3%)	592 (11.9%)		
CCIa=0 (n=									0.022
CCIa=1–2 (									
CCIa=3–4 (									
CCIa>4 (n=									
Fatal cases (									<0.001
Nonfatal cas									

Charlson Comc
^Statistical sig

Admissions	Monday	Saturday	Sunday	Chi-square^	p
Fatal cases (n = 1074; 11.1%)	167 (15.5%)	162 (15.1%)	148 (13.8%)	36.786	< 0.001
Nonfatal cases (n = 8583, 88.9%)	1456 (17.0%)	988 (11.5%)	913 (10.6%)		

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

	Weekday*	Weekend–holiday**	Chi-square[a]	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%)		
CCIa = 0 (n = 23, 0.2%)	13 (56.5%)	10 (43.5%)	18.236	<0.001
CCIa = 1–2 (n = 731, 7.6%)	560 (76.6%)	171 (23.4%)		
CCIa = 3–4 (n = 2529, 26.2%)	1971 (77.9%)	558 (22.1%)		
CCIa >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%)		

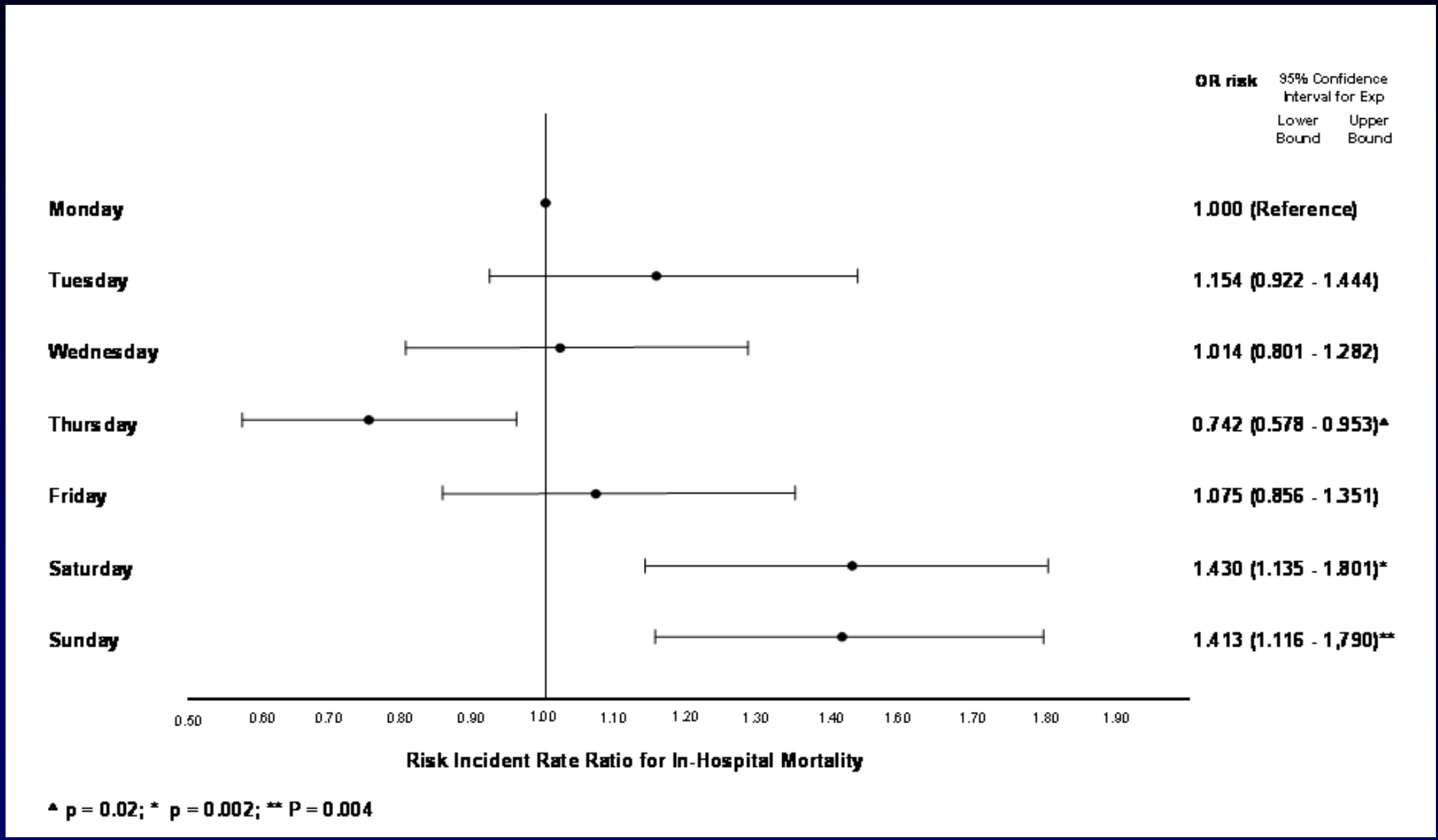
Charlson Comorbidity Index age adjusted = CCIa.

* Expected 71.4%.

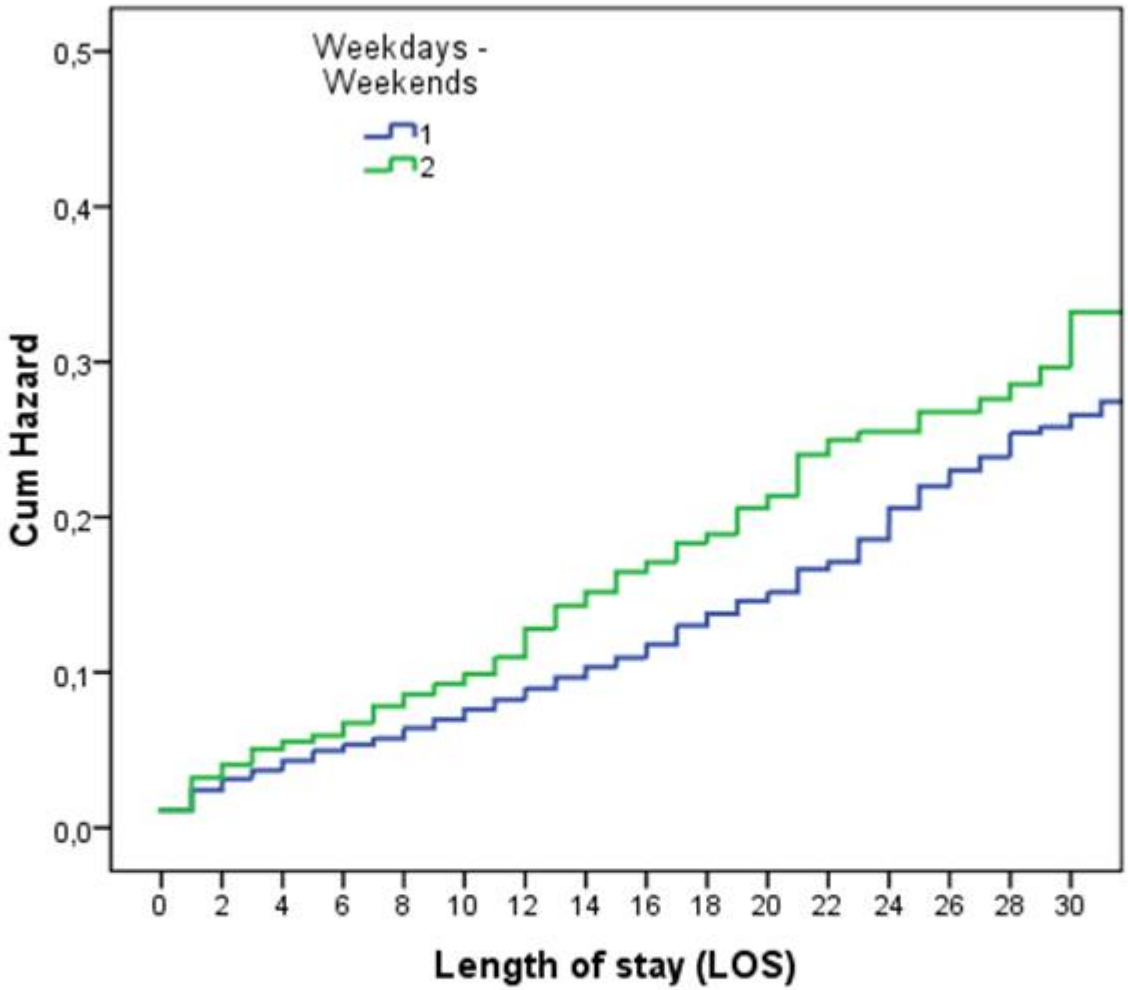
** Expected 28.6%.

[a] Statistical significance of p value is bases on the Bonferroni correction for multiple comparison.

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[a,b]

-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

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 week-end 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

LIMITS OF THE STUDY

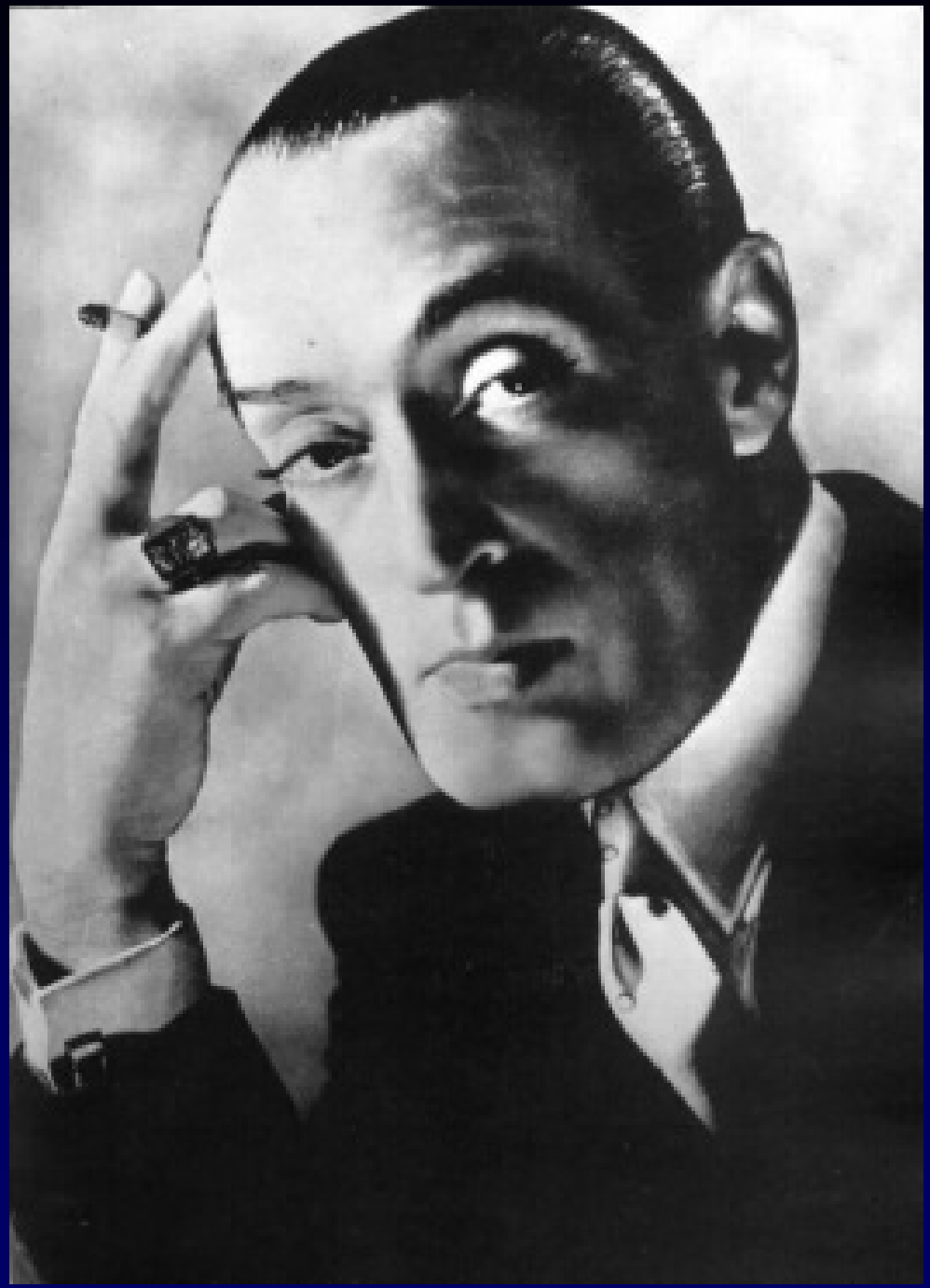
- a retrospective studies based on ICD-9 coding
- although we used several techniques to adjust for severity of illness, it is possible that the observed mortality difference between WE and WD admissions may be due to unmeasured, residual confounding
- we had no information on physician-level and system-level factors with a potential impact on the recommended processes of care and outcomes of HF
- 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

CONCLUSIONS

The circannual seasonal periodicity of CHF deaths and hospitalizations, characterized by a peak incidence in winter months

CHF hospital admissions were most frequent on Monday and least on Sunday, independently of patients' demographic and clinical features.

An increase of in-hospital death was found in patients admitted on WE-holiday compared with WD



Grazie dell’attenzione