A population-based study on overt heart failure in Lombardy (survey of hospitalization in 1996 and 1997)

Edoardo Gronda, Maurizio Mangiavacchi, Bruno Andreuzzi, Annamaria Municinò, Alessandro Bologna, Carlo Schweiger*, Pietro Barbieri**

*Clinical Cardiology and Heart Failure Unit, Cardiovascular Department, Istituto Clinico Humanitas, Rozzano (MI), *Cardiac Rehabilitation Department, A.O. G. Salvini, Passirana di Rho (MI), **Biometry and Medical Statistics Institute, University of Milan, Milan, Italy*

Key words:
Heart failure; Information systems; Outcome assessment; Quality of life.

Background. **The aim of this study was to get updated information about the incidence and outcome of heart failure hospital admission in the whole population of the largest Italy region.**

Methods. **The Lombardy regional database of hospital records (Information System and Quality Control Bureau) provided the requested information: all the heart failure cases admitted to all the institutions of the region were selected by the ICD9 code of congestive heart failure (428-) as the principal or secondary diagnosis. The available data included: diagnosis and surgical procedures (up to four), date of birth, dates of admission and discharge, outcome, DRG code, discharge unit code, gender. The data so obtained concern the hospital discharges in 1996 and 1997.**

Results. **32 093 cases were selected. The mean ages were 74.1 ± 11.5 years for males and 80.6 ± 10.7 for females in 1996, and 71.8 ± 11.7 for males and 78.3 ± 10.6 for females in 1997. Most of the cases were classified as appertaining to DRG 127 – pure heart failure (56.7%). Heart failure associated with myocardial infarction accounted for 7.3% of cases. The remaining cases (36.0%) were classified as appertaining to heterogeneous medical and surgical DRGs. In 1997, the in-hospital mortality was 14.7% for patients aged > 80 years; 9.7% for patients aged between 71 and 80 years; 7.4% for patients aged between 61 and 70 years and 6.9% for patients < 61 years of age with the exclusion of pediatric cases. The in-hospital mortality was different between discharge units: 2.8% of in-patients discharged from cardiology units, and 10.3% of in-patients discharged from general medicine units. The readmission rate at 1 month was 5.49% whereas that within 1 year was 14.3%.**

Conclusions. **Heart failure mortality differences between hospital units are not explained by age and by comorbidity. The readmission rate was lower than in previous reports.**

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Address:

Dr. Edoardo Gronda

Unità Operativa di Cardiologia Clinica ed Insufficienza Cardiaca Istituto Clinico Humanitas Via Manzoni, 56 20089 Rozzano (MI) E-mail: edoardo.gronda@humanitas.it

Introduction

Overt heart failure (HF) is a major public health problem because of its high prevalence: it affects 1-2% of the adult population and up to 8-10% of the elderly[1,2], and represents the leading cause of hospitalization among older adults[3]. In Western communities, it has emerged as an epidemic health problem with major socio-economic implications. Given the fact that western populations are aging and (paradoxically) given the decline in age-adjusted mortality rates due to cardiovascular disease, the absolute number of patients living with impaired cardiac function is expected to increase dramatically over the next few years.

There is evidence that neurohormonal therapy improves the quality of life and reduces mortality, but data from large population-based studies show a substantially unmodified prognosis[4]. The mortality rate within 2 years of the initial diagnosis continues to exceed 40%[5,6] and the rate of rehospitalization within 3-6 months of the first hospital discharge is still higher than 40%[7,8].

How can these data be explained? Part of the problem could be the well-known differences between patients enrolled in clinical trials and the real population of patients with HF. The main issue probably is that only a small number of HF patients receive optimal medical treatment. In European countries, different health care systems may account for different treatment approaches, and these may contribute to the variability in outcomes.

The heterogeneous etiology of HF and differences in the degree of ventricular dysfunction are mirrored by varying levels of treatment requirements. Pharmacological and surgical treatment may be highly efficacious, but the overall effectiveness of medical treatment varies widely because different subsets of the HF population have access to different hospital facilities and medical expertise. It therefore seems to be important to identify these different subsets and their specific hospitalization pictures in order to clarify differences in terms of costs, treatment implications and outcomes.

Administrative data relating to large populations are readily available: they have not permitted the identification of startling variations in practice across small geographic areas and supported research into the outcomes of care, but are also useful as a screening tool for identifying quality problems and targeting areas that might require in-depth investigation[9]. However, no updated information concerning the incidence of hospital admissions in the European population as a whole is available.

On the basis of these observations, we decided to undertake a population-based study of congestive HF admissions in Italy's largest region in order to define methodological tools capable of measuring and explaining the variability in outcomes, and so as to identify quality problems that might be overcome by improved hospital structures and/or optimized and homogeneous medical treatment.

Methods

The Lombardy regional database of hospital records (Information System and Quality Control Bureau) provided the required information: all the patients with congestive HF admitted to all the institutions of the region were selected on the basis of the finding of the ICD9 code of congestive HF (428-) as the principal or secondary diagnosis. The available data included diagnoses and surgical procedures (up to four), date of birth, date of admission and date of discharge, outcome, DRG code, admission and discharge unit code, gender and place of residence. The hospital and individual code were not disclosed in accordance with current rules governing the availability of hospital data, but the subjects were identified on a probabilistic basis by considering their date and place of birth, gender and place of residence.

The data so obtained refer to all hospital discharges in 1996 and 1997. There is unlikely to be any selection bias because all institutions (public hospitals, accredited and non-accredited private hospitals, and research institutions) are required to notify the Regional Office of all hospital discharges of residents every month.

In Italy, the diagnosis coding system in 1996 and 1997 was ICD9, and the procedure coding system ICD9-CM. A transcoding matrix was used to transform the ICD9 diagnosis codes into ICD9-CM codes, which entered the tenth Grouper version for allocation to DRGs. The records were selected by diagnosis and thus encompassed several DRGs. It is unlikely that the transcoding led to any classification bias because the ICD9 diagnosis code of congestive HF (428-) is the same as the ICD9-CM code, and any potential underestimate due to the absence of the specification of HF within the hypertensive heart disease category (402- and 404-) should not have occurred because HF can be specified as a secondary diagnosis. The DRG classification system was implemented in Lombardy in 1992; it has been used for the calculation of hospital payments throughout Italy since 1995. Given the moderate positive effect on the payment of a diagnosis of HF as a complication or as comorbidity, a classification bias due to over-rating may be expected in later years but not in 1996 and 1997. However, the fact that some outcomes classified as self-discharges refer to terminal patients sent home just before death may represent a potential classification bias.

The DRG 127 readmission rate was calculated on the basis of the admission of the same subject (the same date and place of birth, gender and place of residence) to any hospital in the region within 1 month of a previous discharge allocated to the same DRG (127).

Statistical analysis. An exploratory descriptive analysis was performed in order to identify the variables associated with the outcome: the risk of in-hospital death or readmission within 1 month of a previous discharge.

The mean and median values and pertinent variability measures were calculated for quantitative variables (age and length of stay) depending on the distributive characteristics. The χ^2 test was used to assess the association between qualitative variables or between classes of quantitative variables. Confounding variables were evaluated by means of stratification and assessed by multiple logistic regression analysis.

The predictive variables were selected by means of a stepwise procedure using the BMDP statistical software (BMDP Statistical Software Inc., Los Angeles, CA, USA).

The independence of the observations was presumed, and the potential violation of independence due to readmission was disregarded.

Some of the available covariates (age, gender and comorbidity) were considered confounders because they cannot be modified by medical treatment. Only one of the available variables (the discharge unit) was considered because it may correlate with quality problems.

Results

Patient characteristics. A total of 32 093 records in 1996 (16 066 males, 16 027 females) and 34 948 (17 196 males, 17 752 females) in 1997 were considered: these accounted for about 2% of all hospital admissions in Lombardy.

In 1996, the mean ages ± SD of the male and female patients were 74.1 ± 11.5 and 80.6 ± 10.7 years respectively; the corresponding figures in 1997 were 71.8 ± 11.7 and 78.3 ± 10.6 years.

The risk of in-hospital mortality for patients admitted with HF was 11.0% in 1996 and 10.9% in 1997; the proportions of self-discharges were respectively 2.1 and 2.3%.

The DRG distribution of cases and risks of death are shown in table I. Most of the cases were allocated to DRG 127 (congestive HF), the most specific condition and characterized by the lowest risk of death; some were allocated to the DRG family of myocardial infarction, which is characterized by the highest risk of death, and about one third to other DRGs. Of the 34 948 discharges of HF patients in 1997, 20 584 were allocated to DRG 127, 2319 were myocardial infarctions, 2634 were associated with respiratory diseases, 1338 were allocated to cardiac arrest or atherosclerosis or vascular disease or hypertension (DRGs 129-134), 765 to catheterization DRGs, 525 to pacemaker DRGs, and 555 were associated with arrhythmias. The remaining cases were distributed among the other DRGs. In the same population, 29 410 subjects (84.15%) were discharged alive, 3806 (10.89%) were classified as in-hospital deaths, 811 (2.32%) as self-discharges, and 921 patients (2.63%) were transferred to another hospital.

The distribution of the 1997 cases by discharge unit and age is shown in tables II and III; general medicine units discharged about 60% of patients. The modal age class was "> 80 years" (38.3%).

The length of stay varied considerably depending on the DRG (Table IV), the greatest value for HF being associated with heart transplantation. Table IV also shows the length of stay by discharge units: general medicine and cardiology units had very similar values and together accounted for 83.5% of the cases.

The relationship between age and outcome of the 1997 discharges allocated to DRG 127 (pure HF) is shown in table V. Mortality increases with age. The odds ratio of death related to self-discharges was < 1 for the younger age classes (< 41 years), about 3 for patients aged 41-80 years, and 4.2 for those aged > 80 years: therefore the potential classification bias due to self-discharges changes with age.

Mortality. The risk of in-hospital death by discharge units in 1997 (all DRGs with congestive HF) varied from 2.8% (cardiology) to 10.3% (general medicine),

Table II. Distribution of cases by discharge unit in 1997.

Discharge unit	No. cases
Cardiology unit	8168 (23.4%)
General medicine unit	21 005 (60.1%)
Coronary care unit	739 (2.1%)
Intensive care unit	470 (1.3%)
Geriatric unit	1056 (3.0%)
General surgery unit	369 (1.1%)
Cardiac surgery unit	167 (0.5%)
Other units	2974 (8.5%)

Table III. Distribution of cases by age class in 1997.

Age class (years)	No. cases
< 11	52 (0.1%)
11-40	309 (0.9%)
41-50	733 (2.1%)
51-60	2404 (6.9%)
61-70	6996 (20.0%)
71-80	11 073 (31.7%)
> 80	13 381 (38.3%)

Table IV. Length of stay (days) by some DRGs and discharge unit.

DRG	
103 (heart transplantation)	61.0 ± 85.0
104-105 (valvular surgery)	26.0 ± 19.4
106-107 (coronary bypass)	19.9 ± 17.4
112 (coronary angioplasty)	15.4 ± 10.5
115-116 (pacemaker implantation)	12.1 ± 9.2
121-122-123 (AMI)	14.2 ± 8.1
124-125 (catheterization)	14.6 ± 17.8
127 (CHF)	11.9 ± 9.4
Global value	13.2 ± 11.3
Discharge unit	
Cardiology unit	12.2 ± 10.2
General medicine unit	12.9 ± 9.0
Coronary care unit	10.1 ± 9.8
Intensive care unit	17.4 ± 19.7
Geriatric unit	16.1 ± 19.6
General surgery unit	15.7 ± 14.1
Cardiac surgery unit	22.3 ± 27.1

Abbreviations as in table I.

Table I. Distribution of cases by DRG and risk of death.

DRG	1996		1997	
	% of cases	Death risk	% of cases	Death risk
127 (CHF)	56.7	7.9	58.9	8.0
121, 122, 123 (AMI)	7.3	15.0	6.6	15.7
Others	36.0	14.9	34.5	14.8
No.	32 093		34 948	

AMI = acute myocardial infarction; CHF = congestive heart failure.

Table V. Outcome by age class in 1997 (DRG 127).

Age class (years)	Discharged alive	Self-discharge	Sent to another hospital	Dead
< 11	12	2	3	1
11-40	111	5	7	4
41-50	288	5	10	18
51-60	1157	17	34	49
61-70	3532	69	107	191
71-80	5932	138	122	422
> 80	7064	230	79	975
Total	18 096	466	362	1660

37.7% (coronary care) and 76.8% (intensive care); the corresponding figures for DRG 127 alone were 3.0, 7.83, 27.7 and 57.4%.

Cardiology and general medicine units accounted for 89.60% of the discharges relating to the 18 191 patients allocated to DRG 127 in 1997: the analysis restricted to these cases revealed a risk difference of 4.83% (95% confidence interval 4.08-5.58%).

The potential confounding effect of age on the relationship between outcome and discharge unit can be seen in table VI: as there are differences in every age class, age alone cannot explain the difference in the risk of death between cardiology and general medicine units. Furthermore, there were still some differences after pooling the data relating to cardiology and coronary care units (which sometimes belong to the same functional unit).

The other evaluable potential confounders of the relationship between outcome and discharge units were gender and comorbidity which, on the basis of our preliminary exploratory analysis, were restricted to diabetes, chronic obstructive pulmonary disease, renal failure and shock.

All of the potential explanatory variables (discharge units, age, gender and comorbidity) were tested by means of multiple logistic regression analysis. The full model includes all but one (renal failure) of the variables identified in the exploratory analysis (Tables VII and VIII); however, problems of interpretation arise because the predictive power of some (gender, diabetes and chronic obstructive pulmonary disease) was fairly low.

The exponentials of the partial regression coefficients indicate the odds ratios for each risk factor, and show that the risk of death due to HF in long-care units was 5.16 times greater than in cardiology units (95% confidence interval 2.73-9.76), regardless of age and comorbidity or complications. The independent risks of in-hospital death in intensive care/coronary care and general medicine units were respectively 21.7 and 2.27 times higher than in cardiology units.

Readmissions. The DRG 127 readmission rate within 1 month of a previous discharge was 5.49%, and slightly higher in males than in females (6.30 vs 4.23%).

The age-related readmission rates are shown in table IX which indicates a progressive increase from 41 to 70 years, followed by a subsequent decline; no significant difference in readmission rates was found between the discharge units.

Discussion

Hospital admission and length of stay. Congestive HF accounted for 2.2% of all hospital admissions in Lombardy in 1997, and for 16.3% of all of the DRGs in MDC 5 (cardiovascular diseases). The absolute number of hospitalizations increased dramatically with age, thus reflecting the age-related increase in the prevalence of HF previously described in the literature[4,5,9,10]. The mean age of admission was 70-80 years and was higher in men than in women: this is higher than that reported in previous studies[4,11] probably because of the

Table VI. Relationship between outcome and discharge unit within age classes.

Age class (years)	Death risk (%)			OR Medicine/Cardiology	SE
	Cardiology	Cardiology + CCU	Medicine		
51-60	1.50	2.22	3.35	2.24	1.16
61-70	1.84	3.31	3.77	2.05	0.57
71-80	2.32	4.32	6.13	2.64	0.54
> 80	5.84	7.58	10.29	1.76	0.25

CCU = coronary care unit; OR = odds ratio; SE = standard error.

Table VII. Multiple logistic regression: prediction of in-hospital mortality. Full model: estimation of regression coefficients and related odds ratios.

Variable	Coefficient	SE	Exponentials (coefficient)	95% CI of exponentials (coefficient)
Age (years)				
61-70 vs < 61	0.369	0.195	1.45	0.99-2.12
71-80 vs < 61	0.894	0.182	2.45	1.71-3.49
> 80 vs < 61	1.493	0.180	4.45	3.13-6.33
Gender				
Female vs male	-0.209	0.065	0.81	0.71-0.92
Discharge unit				
Medicine vs Cardiology	0.821	0.108	2.27	1.84-2.81
ICU/CCU vs Cardiology	3.075	0.157	21.7	15.9-29.5
Long care vs Cardiology	1.641	0.325	5.16	2.73-9.76
Comorbidity/complications				
Diabetes	-0.356	0.090	0.70	0.59-0.84
COPD	-0.381	0.099	0.68	0.56-0.83
Shock	3.356	0.256	28.7	17.4-47.4

CCU = coronary care unit; CI = confidence interval; COPD = chronic obstructive pulmonary disease; ICU = intensive care unit.

Table VIII. Multiple logistic regression: prediction of in-hospital mortality. Summary of stepwise results for the full model.

Step	Term entered/removed	df	Log likelihood	Improvement χ^2	p
0			-4381.818		0.000
1	Discharge unit	3	-4187.417	388.803	0.000
2	Shock	1	-4093.784	187.264	0.000
3	Age	3	-3993.846	199.877	0.000
4	Diabetes	1	-3985.560	16.572	0.000
5	COPD	1	-3979.240	12.639	0.000
6	Gender	1	-3974.061	10.358	0.000

COPD = chronic obstructive pulmonary disease.

Table IX. Readmission rates within 1 month for each age class.

Age class (years)	No. admissions	No. readmissions
< 40	170	10 (5.56%)
41-50	195	9 (4.41%)
51-60	867	48 (5.25%)
61-70	2806	230 (7.58%)
71-80	5300	306 (5.46%)
> 80	7908	344 (4.17%)
Total	17 246	947 (5.49%)

overall increase in the average age of the population and because of the much higher prevalence of HF among the elderly.

The mean length of hospitalization was 13.2 days, but there were marked differences between hospital units: the longest in-patient stays were in general surgery units, followed by geriatric units. In a Scottish study of hospitalizations due to HF[10], the mean in-patient stay was only 6.9 days in cardiology wards, but was much longer in geriatric wards (a mean length of 27.2 and 29.0 days for men and women, respectively). The mean length of stay in our geriatric units was 16.1 days, a difference that may reflect differences in the structure of the health care system in terms of the distribution of available resources and the management of HF in the elderly. For this reason, data concerning the relative percentages of admissions due to HF in individual hospital units are very variable and cannot be compared[12].

Death. HF was associated with a high risk of in-hospital death: about 11% overall and about 8% within DRG 127. These data are consistent with the results of a study performed in Connecticut[8]. However, another study evaluating the period 1980-1990[10] found HF-related death rates of respectively 22.9 and 18%. The better survival in our study may reflect a trend towards better in-patient management, but other data show stable mortality rates in the 1980's[13] and mortality has remained unchanged over the last few decades[4].

In accordance with other studies[10], our data reveal a higher mortality among the elderly and a close correlation with age: the odds ratio for patients aged ≥ 70 years was > 3 (Tables VI-VIII).

The most relevant datum concerning the risk of death was the significant difference in in-hospital mortality among the discharge units: the difference in risk between internal medicine and cardiology units was 4.83% (95% confidence interval 4.08-5.58%) and, even after taking into account the weights of some potential confounders (age, gender, comorbidity) measured by means of logistic regression analysis, the risk of in-hospital death was still twice as high as in the internal medicine units (2.18; 95% confidence interval 1.77-2.70).

Internal medicine and cardiology units account for about 90% of all discharges but, although it represents a very important issue, there is still a lack of data concerning the outcomes of HF patients in different care units. Most HF patients are cared for by physicians other than cardiologists and, in order to improve the use of resources, a greater effort should be made to promote optimal disease management outside cardiology units. The patients followed by cardiologists are more frequently treated on the basis of guidelines for different cardiology diseases[14-16] and specifically for HF[17,18]. Results similar to those of our study have also been found in an evaluation of treatment patterns and outcomes in patients with unstable angina, and were ascribed to differences between internist and cardiologist management: "Patients with unstable angina were less likely to receive effective medical therapy or revascularization procedures and experienced a trend towards a poorer outcome"[15]. The evaluated outcome in that study was the post-discharge mortality, whereas we considered the in-hospital mortality; furthermore, the two studies were also different in terms of geographical context, study design and the evaluated clinical condition (the relative weights of medical and surgical treatment are different in unstable angina and HF).

In case of HF, cardiologists evaluate left ventricular function more often and use ACE-inhibitors more frequently and at more appropriate doses than generalists[17]; however, opinions as to whether specialist or generalist disease management is better are more or less equally divided. Our own data seem to indicate that specialist hospital management of congestive HF is better in Lombardy. Two explanations may be offered: greater adherence to congestive HF treatment guidelines in cardiology units or differences in the disease stage of admitted patients. Other published data indicate that the management of HF in conformity with the guidelines can lead to a better clinical outcome[13,19], and that the lack of use of ACE-inhibitors in the elderly is related to an increased cardiovascular risk[20]. However, these refer to treatments with a possible effect on the long-term outcome rather than on the in-hospital prognosis and cannot explain the difference in mortality between cardiology and medicine units. However, the severity of HF does not necessarily correlate with the comorbidity.

Some of the results shown in tables VII and VIII require discussion: it seems that diabetes and chronic obstructive pulmonary disease have a slight protective effect on in-hospital mortality (exponential of regression coefficients 0.70 and 0.68). This may be explained by the lower threshold of hospital admission in patients with comorbidity than in those with HF alone.

Shock was associated with a very high risk of death: this was the only available information about a very advanced stage of disease.

Readmissions. The rate of readmissions for congestive HF was lower in our study than in American Veterans Affairs hospitals[21] but the duration of hospital stays was longer. The published evidence of an inverse correlation between the length of stay and the readmission rate is not very strong, but it can be argued that a longer stay may be used in order to achieve clinical stabilization and to educate patients in the self-management of HF at home, thus reducing the number of repeated admissions. However, one study[10] found that the increasing number of hospitalizations over a 10-year period was not due to an increased rate of repeat admissions, since this remained the same; furthermore, another study[8] found that a longer stay was a significant predictor of readmission (odds ratio 1.32) that reflected a worse clinical condition needing more days of hospitalization rather than better patient stabilization.

The incidence and outcome of HF tend to vary according to gender: although the data are not unequivocal[5], a higher incidence and poorer outcome has been found in men[4] and our data confirm previous findings that the readmission rate tends to be slightly higher in males[8].

It is interesting to note that our study did not reveal any correlation between the rate of readmissions and discharge units despite the fact that mortality was lower among the patients cared for by cardiologists. However, it must be admitted that the post-discharge period used to define readmission may have masked the possible long-term benefits of different therapies, and that we could not analyze the drug prescription at the time of discharge. The probability of readmission significantly increased with age up to the 61-70 years age group, and then slightly declined. However, these data do not account for the higher frequency of comorbidity that may be related to an increase in out-of-hospital mortality.

Recently published data from a survey study performed over a 6-month observation time in 11 cardiology departments and 12 medicine departments, in another northern area of Italy, show that ACE-inhibitor prescription at the time of discharge was 100% in the cardiology patient population vs 74% in the internist population. Beta-blockers as well were much more frequently prescribed by cardiologists (41 vs 4%)[22].

These differences in therapeutic regimens as well as the older age and the higher frequency of comorbidity in the patient population treated by internists might affect the outcome. However, in our study, the in-hospital risk of death was associated with admission in medicine units independently of age and comorbidity such as diabetes and chronic obstructive pulmonary disease, accounting for a relative risk of death that was almost twice in medicine units compared to cardiology units. Caution should also be used in comparing results based on data obtained with different time frames and using a different collection method.

Similarly, in another recently published study data obtained from the national Scotland database were used to analyze a patient population after the first hospital admission for HF symptoms. The median age (72 years for males and 78 years for females) of the population of this study was similar to ours. The 1-year mortality in this population was very high (44.5%), although an encouraging trend towards a reduction in mortality was found over the 10-year observation period. This clearly suggests a pivotal role of the different therapeutic regimens adopted in different eras in determining the prognosis[23].

Study limitations. Our study population included all of the patients admitted to hospital for HF in the largest Italian region in 1996-1997, and so our data are based on a very large sample.

The in-hospital risk of death is somewhat underestimated because some self-discharges should actually be classified as in-hospital deaths. This was probably the most relevant bias in this analysis. The extent of the impact of the misclassification of outcome can only be estimated by analyzing clinical records, and a sample of clinical records from a subgroup of hospitals analyzed in the context of a 1998 quality assurance program revealed that misclassification bias accounted for about half of the self-discharges for congestive HF (DRG 127). This figure was very variable: in some hospitals, the proportion of misclassifications was almost zero but, in others, it was high enough to jeopardize the validity of any model of in-hospital mortality. Analysis of the regional data revealed that the proportion of self-discharges was about 2% and, assuming a misclassification bias of 50%, the risk of in-hospital death would be about 12% instead of 11%. Given the variability of the figure, at a small area level of analysis, a preliminary inspection of clinical records or diagnosis codes should be undertaken in order to assure the validity of the evaluation.

The other potential statistical bias was the assumption of the independence of the observations, an assumption required by all of the statistical methods used. Although the exclusion of readmissions from the data set may increase the internal validity of the analysis and thus reassure statisticians, it may decrease the external validity of the model because of its lower applicability. From the statistical point of view, this problem was partially taken into account by introducing a dummy variable identifying the readmissions. This was excluded by the stepwise selection of the predictive variables in the logistic model; the lack of independence therefore does not seem to jeopardize the validity of the analysis.

The extraction of cases with the ICD9 code of congestive HF as the principal or secondary diagnosis meant that subgroups of significant clinical conditions were not excluded, and thus assured the most extensive description of the phenomenon. Otherwise, a specific analysis would have been required for each of the very heterogeneous clinical conditions collected: pure HF, HF during myocardial infarction, HF and surgery, and HF associated with other medical conditions selected as the principal diagnosis. The descriptive data are globally reported, but the explanatory analysis concentrated on pure HF described by DRG 127.

Another important limitation is the lack of clinical information in the analyzed database. It would be better to have a more comprehensive database allowing the description and analysis of disease severity and of the different determinants of clinical outcome.

In conclusion, our data describe the phenomenon of HF in a geographical setting that can help in the collection of information useful for the establishment of appropriate healthcare facilities.

The in-hospital mortality was higher in medicine than in cardiology units, a finding that was not explained by a different distribution of comorbidity. The stage of disease was not precisely measured because of the type of information available. However, our data indicate that a more in-depth investigation is needed on the grounds of the two hypotheses that the degree of adherence to congestive HF guidelines is different in the two types of hospital unit, and that specialist hospital units admit patients with less advanced disease. Both of these situations need to be corrected: as most HF patients are admitted to general medicine units, a special effort should be made to improve the use of resources from the time of initial diagnosis (using appropriate investigative techniques) to the better management of the disease in accordance with the guidelines; furthermore, a better description of disease stage is required. The relevance of these objectives is related to the epidemiology of cardiovascular diseases: the continuing reduction in mortality due to myocardial infarction has contributed to the increasing morbidity and mortality associated with congestive HF.

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