Clinical Characteristics, Treatment and Short-Term Morbidity and Mortality of Patients With Heart Failure Followed in Heart Failure Clinics. Results of the BADAPIC Registry

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Introduction and objectives. Despite recent improvements in therapy, heart failure is still associated with high mortality and hospitalization rates. New management strategies such as heart failure clinics could help to improve this situation.

Patients and method. We analyzed the clinical features, treatment, morbidity and mortality of 3909 patients with heart failure followed at 62 heart failure clinics in Spain in the last 3 years (BADAPIC Registry). Mean follow-up time was 13±4 months.

Results. Mean age was 66±12 years (40% of the patients were older than 70 years), and 67% were male. Etiology was ischemic heart disease in 41% of the cases, systemic hypertension in 19%, idiopathic dilated cardiomyopathy in 17%, valvular disease in 17%, and other in the remaining 6%. Left ventricular ejection fraction was <45% in 68% of the patients. After inclusion in the BADAPIC Registry, 86% of the patients received diuretics, 37% received digoxin, 87% were given angiotensin-converting enzyme inhibitors or angiotensin receptor antagonists, 32% received spironolactone, 59% received beta-blockers and 28% were given nitrates. Actuarial survival at 24 months was 87%, admission-free survival was 80% and event-free survival was 76%. Survival was similar in men and women, higher in patients younger than 70 years (*P*<.05), and slightly higher in those with left ventricular ejection fraction >45% (*P*=.08).

Conclusions. The treatment received by patients included in the BADAPIC Registry closely approached the recommended standards. Their short-term survival rate was very high.

Key words: *Heart failure. Treatment. Prognosis.*

Características clínicas, tratamiento y morbimortalidad a corto plazo de pacientes con insuficiencia cardíaca controlados en consultas específicas de insuficiencia cardíaca. Resultados del Registro BADAPIC

Introducción y objetivos. La insuficiencia cardíaca (IC) sigue presentando elevadas tasas de mortalidad y reingresos, a pesar de los avances realizados en su tratamiento. Nuevas estrategias de manejo, como las consultas específicas de IC, podrían mejorar esta situación.

Pacientes y método. Hemos analizado las características clínicas, el tratamiento y la morbimortalidad en 3.909 pacientes con IC atendidos en 62 consultas de IC participantes en el registro BADAPIC (base de datos de pacientes con IC) en los últimos 3 años. El tiempo de seguimiento medio fue de 13 ± 4 meses.

Resultados. La edad media fue de 66 ± 12 años (el 40% mayores de 70 años), y el 67% eran varones. La etiología de la IC fue isquémica en el 41% de los casos, hipertensiva en el 19%, miocardiopatía dilatada idiopática en el 17%, valvular en el 17% y otras en el 6% restante. La fracción de eyección del ventrículo izquierdo (FEVI) era menor del 45% en el 68% de los casos. Tras la consulta de inclusión en el registro BADAPIC, recibieron diuréticos el 86% de los pacientes, digoxina el 37%, inhibidores de la enzima de conversión de la angiotensina (IECA) o antagonistas del receptor de angiotensina (ARA) el 87%, espironolactona el 32%, bloqueadores beta el 59% y nitratos el 28%. La probabilidad de supervivencia a los 24 meses fue del 87%; la supervivencia libre de ingresos por IC, del 80% y la supervivencia libre de eventos, del 76%. La supervivencia fue similar para varones y mujeres, mayor para los pacientes menores de 70 años (p < 0,05) y ligeramente superior para los casos de fracción de eyección > 45% (p = 0,08).

Conclusiones. El tratamiento utilizado en este registro se acerca a los estándares recomendados; la supervivencia a corto plazo es muy elevada en nuestros pacientes.

Palabras clave: *Insuficiencia cardíaca. Tratamiento. Pronóstico.*

INTRODUCTION

Heart failure is the final outcome in a number of heart diseases. The incidence and prevalence of heart failure are increasing not only because the population is aging but also due to lower mortality rates associated with improved treatment of most heart diseases leading to heart failure, especially ischemic heart disease.[1] Advances in the treatment of heart failure, both pharmacological and non-pharmacological, have lowered associated death and disease, at least according to data obtained from clinical trials.[2-5] However, these important improvements have not been reflected in those studies and registries which analyze a more general population of patients with heart failure, in whom the rates of death and readmission remain high.[6-9] In an attempt to resolve these problems, new organizational strategies for the care of patients with heart failure have been developed, such as interventional and education programs and specific heart failure clinics or units.[10-12] Four years ago the Working Group on Heart Failure, Heart Transplantation and Other Therapeutic Alternatives of the Spanish Society of Cardiology set up a registry of heart failure units, the BADAPIC Registry (an acronym for "Base de Datos de Pacientes con Insuficiencia Cardíaca"—database of patients with heart failure). This paper presents the initial results of this registry.

PATIENTS AND METHODS

The BADAPIC Registry is the official registry of the Working Group on Heart Failure, Heart Transplantation and Other Therapeutic Alternatives of the Spanish Society of Cardiology. The registry, set up in 2000 by the Working Group on Heart Failure, is voluntary and so far includes the participation of 62 centers from all over Spain that have specific heart failure units or clinics. The organization and structure of these units vary greatly; each center is free to organize itself in accordance with its health care possibilities. The only requirement for participation in the registry is the existence of a specific office for patients with heart failure and the inclusion of all the patients seen in a common database, which was designed and developed by the Working Group on Heart Failure of the Spanish Society of Cardiology and agreed by consensus of all the participating centers. This database includes more than 100 variables dealing with the main demographic, clinical and analytical characteristics, as well as functional tests, pharmacological and non-pharmacological therapy, and the evolution of the patient. Since the start of the registry in 2002, the data have been collected annually at the end of the year. The data presented here correspond to those collected at the end of 2000, 2001, and 2002. At the end of the year each center provides the data corresponding to all the patients included for the first time in their heart failure clinic or unit as well as updated data (the latest revision) for each patient already included in the BADAPIC database. This first report of the BADAPIC Registry corresponds, therefore, to 2000-2002 and includes the data on 3909 patients from 62 heart failure units or clinics throughout Spain. The participating centers and researchers are shown in Annex 1.

Characteristics of the Participating Units

Of the 62 hospitals, 14 (22%) are community hospitals and 48 (78%), general hospitals; 21% of the patients were from the community hospitals and 79% from the general hospitals. Only 10 (16%) of the participating hospitals have a heart transplantation program. Although most units are integrated in cardiology services or areas, eight (13% of the total) depend on the internal medicine service. Figure 1 shows the distribution of the units according to the number of patients included, which ranged from 15-135 per unit. Five percent of the units included at least 25 patients, and 65% included more than 50 patients. Regarding the structural and functional characteristics of the par-
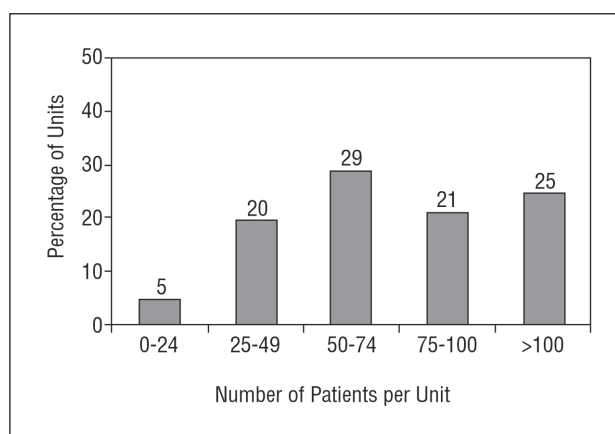

Figure 1. Distribution of the units participating in the BADAPIC Registry according to the number of patients included from each unit.

TABLE 1. Cardiovascular Findings in the Patients Included in the BADAPIC Registry, in the Overall Group and According to Sex*

	Overall (n=3909)	Men (n=2641)	Women (n=1268)	P
High blood pressure	2111 (54%)	1056 (49%)	799 (63%)	<.01
Hyperlipidemia	1368 (35%)	977 (37%)	393 (31%)	NS
Diabetes mellitus	1173 (30%)	713 (27%)	456 (36%)	<.05
Ischemic heart diseasea	1563 (40%)	1241 (47%)	342 (27%)	<.001
Prior acute myocardial infarction	1134 (29%)	977 (37%)	190 (15%)	<.001
Coronary revascularization	547 (14%)	449 (17%)	89 (7%)	<.01
Important valve disease	743 (19%)	449 (17%)	266 (21%)	NS
Prior valvular operation	195 (5%)	132 (5%)	63 (5%)	NS
Prior admission for heart failure	2658 (68%)	1769 (67%)	900 (71%)	NS

*NS indicates not significant; P, statistically significant, men versus women.

TABLE 2. Clinical Characteristics of Our Patients at Inclusion in the Registry, in the Overall Group and According to Sex*

	Overall (n=3909)	Men (n=2641)	Women (n=1268)	P
Age, years	66±12	65±12	71±13	<.001
New York Heart Association functional class				<.05
I-II	2228 (57%)	1637 (62%)	583 (46%)	
III-IV	1681 (43%)	1004 (38%)	685 (54%)	
>2 years heart failure	2345 (60%)	1585 (60%)	773 (61%)	NS
Prior admission for heart failure	2658 (68%)	1769 (67%)	900 (71%)	NS
Cardiac rhythm on ECG				NS
Sinus	2541 (65%)	1769 (67%)	773 (61%)	
Atrial fibrillation	1134 (29%)	714 (27%)	418 (33%)	
Other		234 (6%)	148 (6%)	77 (6%)
Ejection fraction, %	28±14	25±13	41±14	<.001
LVEF>45%	1251 (32%)	714 (27%)	507 (40%)	<.01
Etiology				<.01
Ischemic	1603 (41%)	1215 (46%)	317 (25%)	
High blood pressure	744 (19%)	317 (12%)	368 (29%)	
Idiopathic DCM	664 (17%)	475 (18%)	165 (13%)	
Valvular disease	664 (17%)	449 (17%)	228 (18%)	
Other	234 (6%)	185 (7%)	190 (15%)	

*LVEF indicates left ventricular ejection fraction; DCM, dilated cardiomyopathy.

ticipating units, 18 (29%) have a full-time trained nurse, 8 (13%) have common protocols with their primary care areas with established criteria and referral route, but only 3 (5%) have home health care programs. Half the units, 31, have facilities for their patients to consult them over the telephone or provide free access to the unit without the prior need for an appointment. Most of the units (52, 84%) only have cardiologists, from 1-3 per unit, with internists, geriatricians, psychologists, and social care workers collaborating in the remaining 10 units.

Inclusion Criteria and Definition of the Variables

The diagnostic criteria for heart failure and the definition of the terms and variables to be included in the database were agreed by all the participating units and drawn up in a common written protocol and in the BADAPIC database. The diagnosis of heart failure was made according to the criteria of the Working Group on Heart Failure of the Spanish Society of Cardiology[13] and, with effect from 2001, the criteria of the European Society of Cardiology,[14] after agreement of all the participating researchers. The units included the data related to the first visit to the heart failure clinic by each patient diagnosed with heart failure, as well as the annual follow-up data. The database does not include patients who were diagnosed with heart failure in each hospital but not studied by the heart failure unit or patients who were referred to the units for study and in whom heart failure was excluded. The protocols for the diagnosis and treatment of the patients, as well as the methods of exclusion of other diseases causing symptoms indicative of heart failure, were decided by each unit.

TABLE 3. **Tests Undergone by Our Patients at the Initial Evaluation, in the Overall Group and According to Sex***

	Overall (n=3909)	Men (n=2641)	Women (n=1268)	*P*
Doppler echocardiogram	3205 (82%)	2192 (83%)	1014 (80%)	NS
Radioisotope studies	547 (14%)	396 (15%)	152 (12%)	NS
Cardiac catheterization	1290 (33%)	1056 (40%)	266 (21%)	<.01
Measurement of LVEF	3518 (90%)	2377 (90%)	1141 (90%)	NS
Diastolic function	2111 (54%)	1373 (52%)	723 (57%)	NS
Ergometry	547 (14%)	475 (18%)	114 (9%)	<.05
ECG Holter	704 (18%)	423 (16%)	266 (21%)	NS

*ECG indicates electrocardiogram; LVEF, left ventricular ejection fraction; *P*, statistically significant, men versus women.

TABLe 4. **Pharmacological Treatment Following the Initial Visit, in the Overall Group and According to Sex***

	Overall	Men	Women	*P*
Diuretics	3362 (86%)	2218 (84%)	1128 (89%)	NS
Digoxin	1446 (37%)	977 (37%)	482 (38%)	NS
ACE inhibitors	2775 (71%)	1981 (75%)	773 (61%)	<.05
Enalapril	1720 (62%)	1208 (61%)	487 (63%)	
Ramipril	416 (15%)	317 (16%)	108 (14%)	
Other	639 (23%)	456 (23%)	178 (23%)	
ARA-II	625 (16%)	370 (14%)	257 (20%)	NS
Losartan	306 (49%)	181 (49%)	126 (49%)	
Valsartan	125 (20%)	81 (22%)	44 (17%)	
Other	194 (31%)	108 (29%)	87 (34%)	
Beta-blockers	2306 (59%)	1690 (64%)	596 (47%)	<.01
Carvedilol	1937 (84%)	1386 (82%)	519 (87%)	
Other	369 (16%)	304 (18%)	77 (13%)	
Spironolactone	1251 (32%)	845 (32%)	393 (31%)	NS
Nitrates	1095 (28%)	977 (37%)	254 (20%)	<.01
Calcium antagonists	508 (13%)	317 (12%)	203 (16%)	NS
Anti-arrhythmic agents	547 (14%)	370 (14%)	165 (13%)	NS
Anti-platelet aggregating agents	1603 (41%)	1162 (44%)	444 (35%)	<.05
Anticoagulation agents	1446 (37%)	1004 (38%)	456 (36%)	NS
Statins	1212 (31%)	924 (35%)	292 (23%)	<.05

*ARA-II indicates angiotensin II receptor antagonists; ACE, angiotensin-converting enzyme; *P*, statistically significant, men versus women.

TABLE 5. **Mean Dose of the Most Commonly Used Drugs at the End of the Follow-up Period (mg/day), in the Overall Group and According to Sex***

	Overall	Men	Women	*P*
Furosemide	53±13	51±12	55±14	NS
Torasemide	9±3	10±3	8±3	NS
Carvedilol	21±7	22±7	19±6	NS
Bisoprolol	5±2	5±2	5±2	NS
Enalapril	16±5	16±6	15±6	NS
Captopril	75±13	77±14	70±14	NS
Ramipril	5±1	5±1	5±2	NS
Lisonopril	14±6	15±6	12±5	NS
Spironolactone	32±8	30±7	34±8	NS
Losartan	51±9	50±9	52±10	NS
Valsartan	129±18	127±17	132±18	NS
Amlodipine	7±2	7±2	7±2	NS

*NS indicates not significant; *P*, statistically significant, men versus women.

The normal criteria were used for the definition of the clinical, pathophysiological, and etiological variables included in the database, such as high blood pressure, diabetes mellitus, and dyslipidemia (Tables 1 and 2). The presence of ischemic heart disease was defined by the presence of clinical, electrocardiographic, or angiographic data suggestive of ischemia or myocardial necrosis. The etiology of heart failure was established in each case by the researcher in charge at each center. Although more than one etiological cause may have been present in the same patient, the researcher selected the cause considered to be the most important in that particular patient. Valvular disease was considered to be important and causative of the heart failure when echocardiography or cardiac catheterization showed the presence of ste-nosis, or at least moderate valvular insufficiency. High blood pressure was established as the cause of heart failure when no data suggested ischemic heart disease or any other clinically important cardiac disorder. Idiopathic dilated cardiomyopathy was diagnosed when the left ventricle was dilated and the ejection fraction was below 45%, in the absence of other cardiac disorders. Heart failure with preserved systolic function was diagnosed when the ejection fraction was equal to or higher than 45% and with depressed systolic function when the ejection fraction was below 45% (whatever the etiology).

The protocol established that a patient was considered to have had a complementary test (Table 3) when the test was undertaken during the initial visit to the heart failure unit, or during the previous 6 months if the researcher in charge considered that no important clinical changes had taken place during this period. In the case of repeat tests, the result included in the database was that of the last test performed during the relevant time period. The data regarding pharmacological treatment shown in Tables 4, 5, and 6 are those of the treatment planned after the initial visit.

TABLE 6. **Pharmacological Treatment Following the Initial Visit, According to the Left Ventricular Ejection Fraction***

	<45% (n=2929)	45% (n=980)	*P*
Diuretics	2519 (86%)	784 (85%)	NS
Digoxin	1172 (40%)	294 (30%)	NS
ACE inhibitors	2285 (78%)	539 (55%)	<.01
ARA-II	527 (18%)	118 (12%)	NS
Beta-blockers	1904 (65%)	470 (48%)	<.01
Spironolactone	1084 (37%)	225 (23%)	<.05
Nitrates	879 (30%)	274 (28%)	NS
Calcium antagonists	234 (8%)	245 (25%)	<.05
Anti-arrhythmic agents	410 (14%)	127 (13%)	NS
Anti-platelet aggregating agents	1259 (43%)	372 (38%)	NS
Anticoagulation agent	1113 (38%)	343 (35%)	NS
Statins	966 (33%)	274 (28%)	NS

*ARA-II indicates angiotensin II receptor antagonists; ACE, angiotensin-converting enzyme; NS, not significant; *P*, statistically significant, left ventricular ejection fraction below versus the same as or higher than 45%.

Patient Observation

The frequency of the revisions depended on the clinical judgment of each participating physician, although the follow-up data (changes in treatment and clinical events) were provided annually by each center. The follow-up data analyzed included mortality, admissions for heart failure, acute myocardial infarction, coronary revascularization, valvular surgery, or heart transplant. Analyses were made, according to the methods and tests mentioned in the section on statistical study, of the likelihood of survival, admission due to heart failure and survival free of important cardiac events (those cited previously); this latter variable referred to the first important cardiac event suffered by a patient.

Statistical Study

The descriptive analysis was made using percentages for the distribution of frequencies and the mean ±1 standard deviation for quantitative variables. Comparison of the differences between the various subgroups of patients was made using the χ^2 test for qualitative variables and the Student t test for quantitative variables. The probability of survival and events during the follow-up was calculated by the Kaplan-Meier test, using Mantel's log rank test to compare the survival curves between subgroups.

RESULTS

Demography

As mentioned, the registry included data for 3909 patients between 2000 and 2002 from 62 heart failure
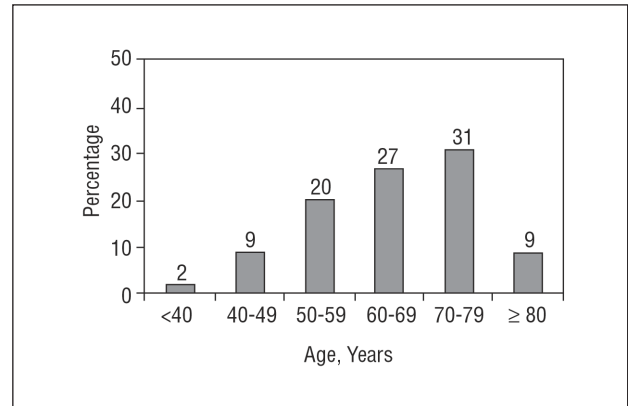

Figure 2. Distribution according to the age of the patients included in the BADAPIC Registry.

units or clinics throughout Spain (Annex). The age of the patients was 66±12 years. Figure 2 shows the distribution of the patients according to the different age groups. The most common age group was the decade from 70-79 years, with 9% (359 patients) aged 80 years or older; the percentage of patients younger than 50 years of age was very low (11%, 430 patients). Sixty-seven percent of the patients (2619) were men and 33% (1290) were women. The referral to the heart failure clinic or unit was made mainly by cardiologists (72% of all the patients, 2382 cases), although 5% (195) were referred from primary care and 23% (1332) from the internal medicine service or other specialties.

Cardiovascular History

Table 1 shows the prevalence of the main cardiological findings during the initial workup, in the overall group and according to the sex of the patient. Notably, 54% (2111) of the patients had high blood pressure and 48% (1013) of these patients had not had their blood pressure controlled during the previous 6 months; this percentage of poor blood pressure control fell to 8% (312 cases) 6 months after the initial visit to the heart failure unit. A history of hyperlipidemia was present in 35% (1368) of the patients and diabetes in 30% (1173). Forty percent (1563) of the patients had a history of ischemic heart disease, 29% (1134) had had a previous myocardial infarction and 14% (547) had undergone coronary revascularization surgery. As seen in Table 1, no differences were detected between men and women in the percentage patients with hyperlipidemia, valvular disease, prior valvular operations, or prior admissions for heart failure. Diabetes mellitus and high blood pressure were significantly more common in women, whereas a history of ischemic heart disease, myocardial infarction, or coronary revascularization were more common in men (Table 1).
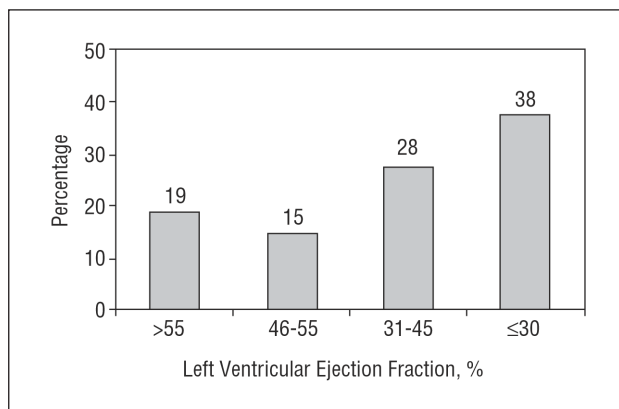
Figure 3. Distribution of the values of the left ventricular ejection fraction in our patients.

Most patients had a long history of heart failure. Only 26% (1016) of the patients had a history of symptoms of heart failure shorter than 1 year, whereas 45% (1498) of the patients had a symptomatic history of heart failure longer than 3 years. Sixty-eight percent (2658) of the patients had been admitted at least once for heart failure and almost half the patients had been admitted two or more times for heart failure. The etiology of the heart failure (Table 2) was ischemic in 41% (1603) patients, hypertensive in 19% (744), idiopathic or alcoholic dilated cardiomyopathy in 17% (644), valvular in 17% (644), and other in 6% (including acute myocarditis, arrhythmias, congenital heart disease, restrictive, and hypertrophic cardiomyopathy, and other specific etiologies). An ischemic cause was significantly the most common etiology in men and hypertension in women, with few differences in the other causes (Table 2). Nine percent of the patients (352 cases) had important anemia, with hemoglobin levels below 10 g/dL, and 15% (586) had chronic renal failure (serum creatinine >1.5 mg/dL).

Characteristics of the Heart Failure at the Visit to the Heart Failure Unit Resulting in Inclusion in the Registry

Approximately half the patients were in functional class I or II and the other half in class III or IV at the time of inclusion in the registry (Table 2). Significantly more women had a more advanced functional class, III or IV (Table 2). The cardiac rhythm on the electrocardiogram was predominantly sinus (65%, 2541 patients) in both men and women. The left ventricular ejection fraction (LVEF) was known (measured during the initial visit to the heart failure unit or during the previous 6 months) in 90% of the patients (3518 cases), with no differences between men and women (Table 3). The mean LVEF was 28±14%, 25±13% in the men and 41±14% in the women,

$P<.001$. The distribution of the LVEF is shown in Figure 3: 66% of the patients (2322 cases) had a LVEF <45%, whereas the remaining 34% had heart failure with preserved systolic function, with LVEF >45%.

Tests Undertaken During the Initial Visit

Table 3 shows the tests undertaken during the initial visit or during the previous 6 months. Doppler echocardiogram was performed in 3205 (82%) patients, a radioisotope study in 547 (14%) patients, ergometry in 547 (14%) patients, Holter in (18%) 704 patients and cardiac and coronary catheterization in 1290 (33%) patients. Other tests, such as endomyocardial biopsy or electrophysiological studies, were very uncommon. The percentages of Doppler echocardiograms, radioisotope studies, and Holter tests were similar in men and women, whereas ergometry and cardiac catheterization were more common in men (Table 3).

Pharmacological Therapy

The pharmacological treatment recommended after the initial visit to the heart failure unit is shown in Table 4. Eighty-six percent of the patients took diuretics, 37% digoxin, 71% angiotensin-converting enzyme (ACE) inhibitors, 16% angiotensin II receptor antagonists (ARA-II), 32% spironolactone, 59% beta-blockers, 28% nitrates, 37% anticoagulation agents, 41% anti-platelet aggregating agents, and 31% statins (the absolute values are given in Table 4). Other drugs, such as antiarrhythmic agents and calcium antagonists, were much less commonly used. ACE inhibitors, beta-blockers, nitrates, anti-platelet aggregating agents and statins were used more by men than women, whereas no differences in use according to gender were seen with diuretics, digoxin, ARA-II, spironolactone, calcium antagonists, or anti-coagulating agents (Table 4). Table 4 also shows the drugs most used within the major groups of pharmacological agents; carvedilol was the most commonly prescribed drug among the beta-blockers, enalapril among the ACE inhibitors, losartan among the ARA-II, furosemide among the diuretics, aspirin among the anti-platelet aggregating agents, amiodarone among the anti-arrhythmic agents, and amlodipine among the calcium antagonists. Only very slight variation was seen during the follow-up in the percentages of the pharmacological agents used, and the pharmacological profile at the end of the observation period was similar to that shown in Table 4. The type of pharmacological agent used during the follow-up was only changed in 10% (390) of the patients. Table 5 shows the doses at the end of the follow-up period for the most commonly used drugs; no significant differences were seen between men and women in the doses used. The variation in pharmacological therapy between the different centers was small. The percen-

tage prescription of diuretics ranged from 81%-93%, of digoxin from 33%-46%, of ACE inhibitors from 65%-81%, of ARA-II from 9%-21%, of beta-blockers from 50%-66%, and of spironolactone from 27%-38%.

Table 6 shows the pharmacological treatment received by the patients according to whether their LVEF was above or below 45%. As can be seen, the patients with a depressed ejection fraction, below 45%, received significantly more ACE inhibitors, beta-blockers, and spironolactone than the patients with preserved systolic function. These patients with preserved systolic function used more calcium antagonists, with no significant differences for the other drugs (Table 6).

Morbidity and Mortality During Follow-up

The overall rate of events, after a follow-up period of 13±4 months, is shown in Figure 4. The overall mortality rate was 6% (234 deaths); the cause of death was cardiovascular in 90% (211) of the patients and non-cardiovascular in the remaining 10% (23) of the patients. Among the cardiovascular deaths, this was due to progression of the heart failure in 59% (138) of the deaths, sudden death in 26% (61) and other causes in the remaining 5%. The overall rates of readmission for heart failure, acute myocardial infarction, other cardiovascular admissions, coronary revascularization or heart transplant were very low (Figure 4), and very similar between men and women. Regarding the functional class at the end of the follow-up period, only 23% (899) of the patients were in functional class III or IV (21% of the men and 28% of the women, P=NS).

The actuarial probability of survival at 24 months was 87%, the probability of survival without admission for heart failure was 80%, and the probability of event-free survival was 76% (Figure 5). The probabilities of survival were similar for men and women, as can be seen in Figure 6. Regarding the systolic function, the patients with a LVEF above 45% had a non-significant trend towards a greater likelihood of overall survival and survival free of admission for heart failure at 2 years (Figure 7), whereas cardiovascular event-free survival was significantly higher in these patients compared to the patients with a depressed ejection fraction. Finally, as can be seen from Figure 8, the patients who were older than 70 years of age had a significantly lower likelihood of survival at 2 years compared with the younger patients.

DISCUSSION

This registry provides a true overall picture of the characteristics and management of heart failure in Spain, within a very well-defined context: patients managed and followed-up in specific heart failure units or clinics. Herein, however, lies its main limitation, as
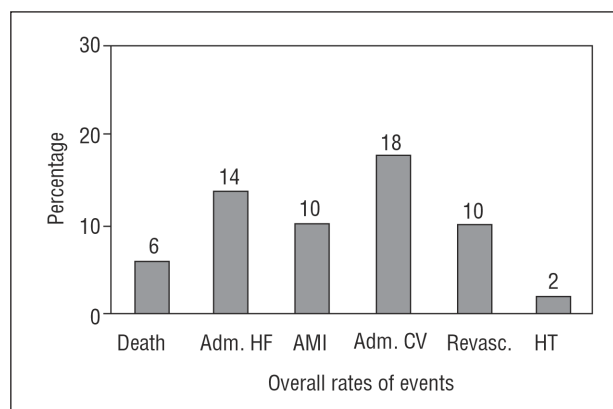

Figura 4. Overall rates of mortality, admission for heart failure and other cardiovascular events in the whole group of patients (n=3909). Adm. HF indicates admission for heart failure; AMI, acute myocardial infarction; Adm. CV, admission for other cardiovascular reasons; Revasc., coronary revascularization; HT, heart transplant.
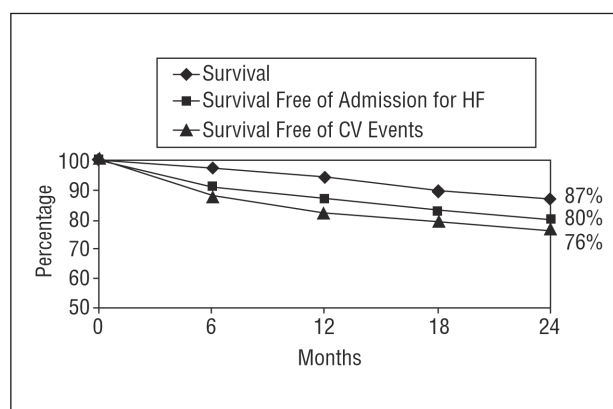

Figure 5. Overall survival curve and curves for survival free of admission for heart failure (HF) and cardiovascular events (CV) (whole group, 3909 patients).

the results can not be extrapolated. The most important characteristics resulting from this registry concern the excellent adaptation of the pharmacological therapy given to that recommended in the heart failure guidelines[15] and the low incidence of mortality and cardiovascular events during the follow-up, aspects which may be related not only with each other but also with other factors.

Pharmacological Therapy

Angiotensin-converting enzyme inhibitors were given to more than 70% of the patients, spironolactone to 32% and beta-blockers to almost 60%. These percentages were even higher in the patients with a depressed LVEF: 78% received ACE inhibitors (and 18% ARA-II), 37% received spironolactone, and 65% received beta-blockers (Table 6). The percentage use
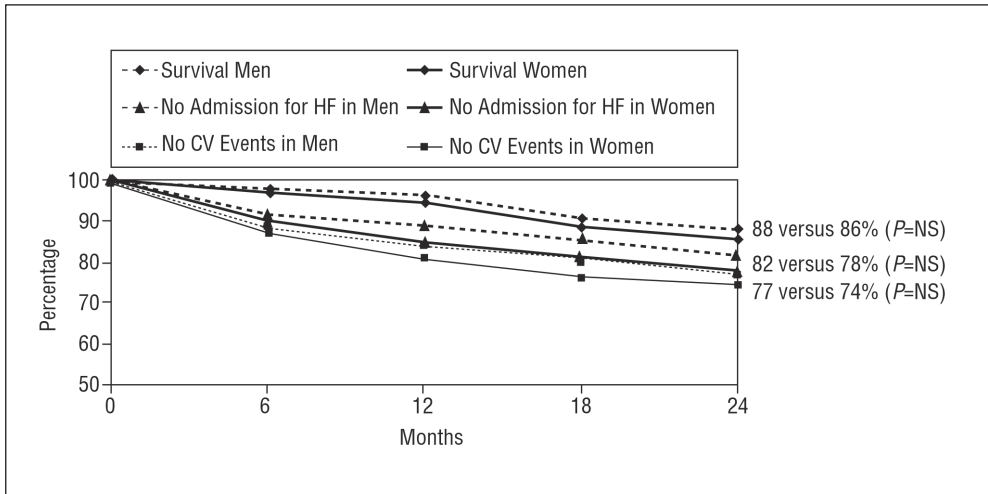
Fig. 6. Overall survival curve and curves for survival free of admission for heart failure (HF) and cardiovascular events (CV), according to sex. No significant differences were seen between men and women in the 3 survival curves.
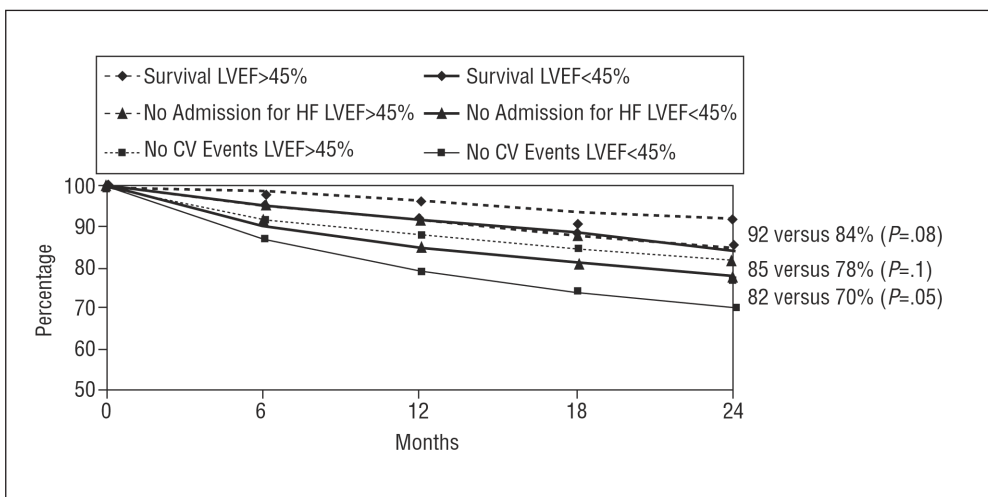

Fig. 7. Two-year likelihood of survival, survival free of admission for heart failure (HF) and survival free of cardiovascular events (CV), according to whether the left ventricular ejection fraction (LVEF) was lower than or equal to or greater than 45%. Patients with an ejection fraction above 45% had a trend to better overall survival and survival free of admission for HF. Survival free of CV events was significantly greater in these patients, compared with the patients who had an ejection fraction below 45%.
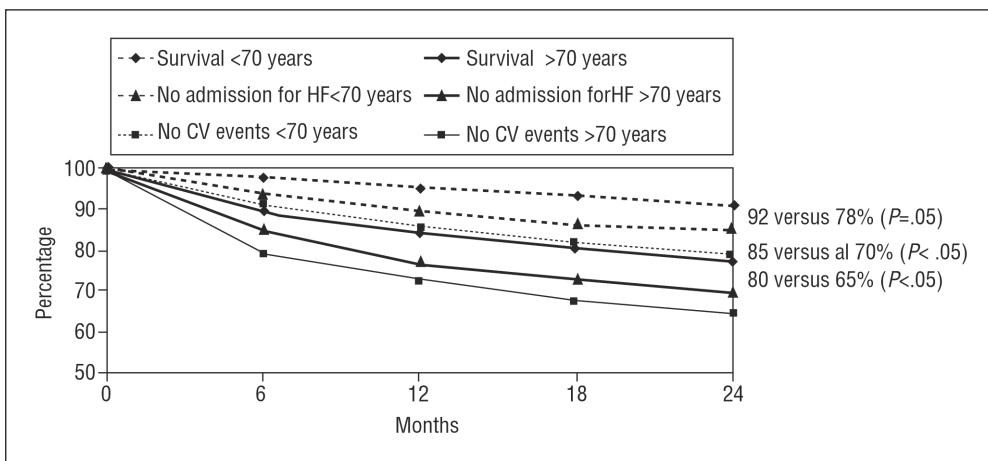

Fig. 8. Two-year likelihood of survival, survival free of admission for heart failure (HF) and survival free of cardiovascular events (CV), according to whether the age was under or over 70 years. The older patients had less probability of actuarial survival.

of ACE inhibitors and beta-blockers in the patients with a LVEF above 45% (55% and 48%, respectively) was significantly lower, but nevertheless still high, probably partly because of the ischemic or hypertensive etiology in many of these patients. In most single-center registries, both in Spain and in other countries,[6-]

[8] the percentage of patients treated with ACE inhibitors, and especially those treated with beta-blockers, is much lower, with recent studies showing the percentage use of beta-blockers to be just 5%.[6] In the recently published EuroHeart Failure Survey,[16] the percentage of patients who received ACE inhibitors or ARA-II was 66% (87% in our registry) and the percentage of patients on beta-blockers was 37% (59% in our study). Some studies in very specialized centers and in a select population of patients have indeed managed to achieve optimal therapy,[17] but the study reported herein shows that achieving adequate therapy, similar to that seen in clinical trials,[2-5] is possible in a large number of centers and units with a very variable organization and structure. In fact, no significant differences were detected in the pharmacological treatment provided by the different participating centers, be they general or community hospitals, as shown by the low variability between centers in the percentage of patients treated with the different drugs. No important differences seen in the treatment of the various subgroups of patients (men and women, LVEF below or above 45%), except those due to the particular characteristics of each group: a greater use of beta-blockers, anti-platelet aggregating agents and nitrates in men (probably related with the greater prevalence of ischemic heart disease) (Table 4), and greater use of ACE inhibitors, beta-blockers and spironolactone in those patients with a depressed LVEF, which is in agreement with the available evidence[15] (Table 4).

Morbidity and Mortality

Another interesting aspect highlighted by the registry is the low rate of mortality and admission due to heart failure. Although the follow-up period was short, a likelihood of 2-year survival of 87% and a likelihood of admission-free survival of 80% are better than those seen in the main clinical trials on heart failure, even the most recent,[2-5] and are much better than those of hospital or population registries.[6-9,16] For instance, Permanyer-Miralda et al[6] reported a mortality rate of 46% at 18 months in a population of patients admitted for heart failure in 1998. Varela-Román et al[9] found a 1-year mortality of 20% in a series of 229 patients admitted in their center due to heart failure.[9] Jong et al,[8] in a study undertaken in 38 702 patients admitted for the first time with heart failure in Ontario, Canada, reported a 1-year mortality above 30% and a rate of mortality or readmission due to heart failure of around 55% at 1 year. However, the characteristics of these patients differed to those of our patients, since their patients were older (around 75 years of age in the studies of Permanyer-Miralda et al and Jong et al, compared with 66 years of age in our series, which was similar to the 66.7 years in the study by Varela-Román et al). Furthermore, coexisting conditions, which were not studied in our registry, were probably greater in the other registries. Thus, we cannot rule out the possibility of a selection bias due to the characteristics of our registry and the criteria for inclusion of the patients in the heart failure clinics, which resulted in the patients having a lower risk.

Randomized studies which have compared the care provided by heart failure units with that afforded by the usual setting have shown a very significant reduction in admissions for heart failure.[11,12] Two randomized studies have recently been published which also showed a significant reduction in mortality,[18,19] one of them a multicenter study in Spain.[19] The Swedish study, with heart failure units based on specialized nursing care, reduced 1-year mortality from 37% in the group receiving the usual care to 13% in the group managed in the heart failure unit (P=.005).[18] The 1-year survival of this series was 87%, slightly lower than that of the BADAPIC Registry (94% at 1 year and 87% at 2 years), although the mean age of the patients in the Swedish study was much higher, 77 years. The methodology of the Spanish multicenter study, PRICE,[19] was more similar to that of the BADAPIC registry, with heart failure units based on cardiologists, and a mean patient age of 69 years. Survival in the patients managed by heart failure units in the PRICE study was 90% at 1 year and 83% at 2 years, figures which are slightly lower than those of the BADAPIC registry. However, the PRICE study only included patients with heart failure who were discharged from hospital and who therefore have a worse prognosis than the patients in the BADAPIC registry, almost half of whom were outpatients with no recent admission. Despite these small differences between the 2 studies of randomized intervention and the observational BADAPIC study, the annual rates of mortality are between 5%-10% in all 3 studies, much lower than the annual mortality rates of 20%-30% in the previously mentioned population registries,[6-9,16] and similar to those of clinical trials.[2-5] Care of patients with heart failure in specialized clinics or units therefore seems to improve the prognosis of these patients.

IMPLICATIONS AND LIMITATIONS

Firstly, the results indicate that production in Spain of a registry dealing with such a common and widespread problem as heart failure, with the participation of numerous centers, is feasible. The findings reported suggest that the diagnostic standards and recommended treatments can be achieved in patients with heart failure by means of the use of specific heart failure units or clinics. This observation does not imply that all patients with heart failure should be seen in this type of center. Collaboration should be encouraged among the different levels of care (specialized units, general clinics, primary care), with the participation of

different personnel, including physicians and nursing staff.[20] This collaboration would result in better care for many patients with heart failure, which should be our ultimate aim. The main limitation of this registry, its observational and non-controlled character, introduces a possible selection bias when evaluating the results concerning the low rates of mortality and morbidity. Nevertheless, the results of randomized interventional studies with specific heart failure clinics support the idea that this type of care can improve the prognosis for patients with heart failure.

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ANNEX. **Centers and Researchers Participating in the BADAPIC Registry (Spanish acronym for "BAse de DAtos de Pacientes con Insuficiencia Cardíaca"—database of patients with heart failure)**

Hospital General in Albacete: Pablo Domínguez Barrio
Fundación Hospital Alcorcón: Elena España Barrio and Elena Batlle López
Hospital General in Alicante: Francisco Sogorb Garri and Vicente Climent Payá
Hospital de Antequera: Jesús Álvarez Rubiera and Álvaro Rubio Alcaide
Hospital San Agustín in Avilés: Gerardo Casares García
Hospital Infanta Cristina in Badajoz: León Martínez de la Concha
Hospital Can Ruti in Badalona: José Lupón Roses and Teresa Pajarón Rodríguez
Hospital San Eloy in Baracaldo: Javier Andrés Novales
Hospital Vall d'Hebron in Barcelona: Stella Méndez and Enrique Galve
Hospital de Terrassa: M.A. de Miguel and David López Gómez
Hospital Mútua in Terrassa: Leandro Sáenz and Amparo Álvarez
Hospital Sant Pau in Barcelona: Domingo Ruiz Hidalgo and Josep Antón Montiel Dacosta
Hospital Clínic i Provincial in Barcelona: Eulalia Roig Monguell and Alfredo Cupoletti Beange
Hospital Sagrat Cor in Barcelona: Francesc Rossell Abaurrea and César Morcillo Serra
Hospital de Basurto in Bilbao: Nekane Murga Eizagaechaverria and Inmaculada Lluís Serret
Hospital San Pedro in Alcántara de Cáceres: Concepción de la Concepción Palomino and Yolanda Porras Ramos
Hospital General in Castellón: José Luis Diago Torrent and Álex Navarro Bellver
Hospital Reina Sofía in Cordoba: Manuel Anguita Sánchez and Soledad Ojeda Pineda
Hospital de Elche, Alicante: Fernando García de Burgos y de Rico and Alejandro Jordá Torrent
Hospital de Galdakao, Basque Country: Javier Zumalde Otegui and Alberto Salcedo Arruti
Hospital de Gandía, Valencia: Plácido Orosa Fernández and Catherine Lauwers Nelisen
Hospital Virgen de las Nieves, Granada: Óscar Baun and José Luis Ventin Pereira
Hospital General in Granollers, Barcelona: Santiago Montull Morer and Rosa Guitard
Hospital del SAS in Jerez, Cadiz: José Carlos Vargas Machuca and Fernando García-Arboleya Puerto
Hospital de Bellvitge, L'Hospitalet de Llobregat, Barcelona: Nicolás Manito Lorite and Edgardo Kaplinsky
Complejo Hospitalario in Leon: Julián Bayon Fernández and Manuela Montes Montes
Hospital La Paz, Madrid: Isidoro González Maqueda, Gabriela Guzmán Martín, Llanos Soler Rangel, and Francisco Arnalich Fernández
Hospital Severo Ochoa, Leganés, Madrid: Ana Isabel Huelmos Rodrigo and Ángel Grande Ruiz
Hospital de la Princesa, Madrid: Mercedes Fernández Escribano
Hospital Costa del Sol, Marbella, Malaga: Emilio González Cocina and Francisco Torres Calvo
Hospital Carlos Haya, Malaga: Manuel de Mora Martín and José María Pérez Ruiz
Hospital Virgen de la Victoria, Malaga: Eduardo de Teresa Galván, Encarnación Molero Campos, and Manuel Jiménez Navarro
Hospital Comarcal in Mendaro, Guipúzcoa: Esther Recalde del Vigo and Nicolás Gurrutxaga Arrillaga
Hospital Provincial Santa María Madre, Orense: Miguel A. Pérez de Juan and Manuel de Toro Santos
Hospital Central de Asturias: Beatriz Díaz Molina and José Luis Rodríguez Lambert
Hospital Río Carrión, Palencia: Fausto Librada Escribano
Hospital General in Majorca: Josefina Gutiérrez Alemany
Hospital de Santa Bárbara, Puertollano, Ciudad Real: José Portillo Sánchez
Hospital Sant Joan in Reus, Tarragona: Francesc Marimón Cortés and Óscar Palazón Molina
Hospital Clínico Universitario in Salamanca: Pedro Luis Sánchez Fernández and Francisco Martín Herrero
Hospital Donostia in San Sebastian: Ramón Querejeta Iraola and Eloy Sánchez Haya
Hospital Marqués de Valdecilla, Santander: José Ramón Berrazueta Fernández
Hospital Clínico Universitario in Santiago de Compostela: José R. González Juanatey and Inés Gómez Otero
Hospital Universitario de Valme, Seville: Juan C. Beltrán Rodríguez and Luis Pastor Torres
Hospital Virgen del Rocío, Seville: Ángel Martínez Martínez
Hospital Joan XXIII in Tarragona: Alfredo Bardají Ruiz and Ramón de Castro Aritmediz
Hospital Sant Pau i Santa Tecla, Tarragona: Lluís Carles Olivan Sayrol and Juan Carlos Soriano Jiménez
Hospital Universitario de Canarias, Tenerife: Antonio Lara Padrón and Francisco Marrero Rodríguez
Hospital General in Valencia: José Antonio Velasco Rami and Francisco Ridocci Soriano
Hospital La Fe, Valencia: Luis Almenar and Joaquín Rueda Soriano
Hospital Doctor Peset, Valencia: Begoña Sevilla Toral and Antonio Salvador Sanz
Hospital Clínico in Valencia: Ángel Llácer and Jaime Muñoz
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