Reduction in Heart Failure Hospitalization Rate During the First Year of Follow-up at a Multidisciplinary Unit

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Introduction and objectives. Heart failure leads to frequent hospital readmissions. The aim of this study was to assess how receiving attention at our multidisciplinary unit influenced hospitalization for heart failure. We compared the number of admissions in the year preceding attendance with that in the first year of follow-up.

Patients and method. In total, 366 patients were admitted between August 2001 and June 2003. Of these, 332 were still alive and could be assessed clinically 1 year later. The most common etiologies were ischemic heart disease in 60%, and dilated cardiomyopathy in 10%.

Results. The number of admissions in the year preceding attendance was 246, while that during the first year of follow-up was 125, which corresponds to a statistically significant reduction of 49% (*P*<.001). The reduction was even greater (54%; *P*<.001), when only patients who were hospitalized more than once in the preceding year were analyzed. Moreover, in addition to the improvements noted during follow-up in patients' understanding of the disease and in several aspects of self-care, the increase in treatment use was also remarkable: beta-blocker use increased from 53% to 70%, spironolactone use from 20% to 30%, and statin use from 36% to 58%.

Conclusions. The number of hospital admissions for heart failure among patients who received attention at our multidisciplinary unit was significantly less in the first year of follow-up than in the year preceding attendance. This reduction was probably due to educational and pharmacologic interventions and to closer follow-up.

Key words: *Heart failure. Prognosis. Hospital admission.*

Reducción de los ingresos por insuficiencia cardíaca en el primer año de seguimiento en una unidad multidisciplinaria

Introducción y objetivos. La insuficiencia cardíaca conlleva un alto índice de reingresos hospitalarios. El objetivo del estudio ha sido evaluar qué efecto producía en las hospitalizaciones por insuficiencia cardíaca el hecho de ser atendido en nuestra Unidad. Para ello hemos comparado el número de ingresos por esta enfermedad en el año precedente y durante el primer año de seguimiento.

Pacientes y método. Entre agosto de 2001 y junio de 2003 se ingresó a 366 pacientes, de los cuales 332 permanecían vivos y con situación clínica conocida al año. La etiología más frecuente era la cardiopatía isquémica (60%), seguida de la miocardiopatía dilatada (10%).

Resultados. El número de ingresos en el año precedente fue de 246, mientras que durante el año de seguimiento ha sido de 125. La diferencia es estadísticamente significativa, con una reducción en el número de ingresos del 49% (p < 0,001). Ésta fue aún mayor en los pacientes con más de 1 ingreso en el año precedente (54%; p < 0,001). Durante el seguimiento, además de la mejoría observada en el nivel de comprensión de la enfermedad y en algunos aspectos del autocuidado, cabe destacar el incremento conseguido en el tratamiento con bloqueadores beta (del 53 al 70%), espironolactona (del 20 al 30%) y estatinas (del 36 al 58%).

Conclusiones. Los ingresos por insuficiencia cardíaca en el primer año de seguimiento de los pacientes atendidos en nuestra Unidad se han reducido de forma muy significativa respecto al año precedente, probablemente gracias a las intervenciones educativa y farmacológica realizadas, así como al seguimiento más próximo.

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

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ABBREVIATIONS

ACE: angiotensin-converting enzyme.
ARA-II: angiotensin II receptor antagonist.

INTRODUCTION

Heart failure is an important cause of admission to hospital and the reason for more than 5% of medical hospitalizations in adults.[1] Admissions to hospital account for the largest part of health costs related to heart failure because hospital stays are usually lengthy and become progressively more frequent.[1]

A variety of drugs, such as angiotensin-converting enzyme (ACE) inhibitors,[2,3] beta-blockers,[4-6] and more recently angiotensin II receptor antagonists (ARA II),[7] have been shown to reduce mortality and the number of admissions to hospital in different clinical trials. However, such drugs are often not used appropriately or they are underused, perhaps because their administration is complex. Appropriate management of these treatments and strict supervision to ensure compliance may reduce unnecessary admissions to hospital given that a substantial percentage of such admissions (<50%) are preventable.[8]

Different models of "unit," "clinic," or "health program" for heart failure have been shown to decrease the number of admissions to hospital (sometimes by as much as 85%).[9-29] The quality of life of the patient and even his or her survival are also improved.[21-25]

In Spain, with the exception of units related to transplantation programs, units specialized in caring for heart failure are still in their initial phases of development, and the results available are generally preliminary. The aim of this study was to analyze what effect the management of patients in a unit specialized in heart failure has had on admission to hospital for this condition.

PATIENTS AND METHODS

We prospectively compared the number of admissions to hospital for heart failure in the year preceding the first year of follow-up with that of the first year of follow-up in a consecutive analysis. Data were reported for all patients with information on the number of admissions who were alive 1 year after their first visit. All patients were attended personally in the unit or assessed by a telephone call after 1 year of follow-up. Stays limited only to the emergency room were not considered as admission to hospital, but short-term stays in hospital services or day hospitals were counted.

The Heart Failure Unit is a multidisciplinary outpatient unit that opened its doors in August of 2001. One full-time nurse is assigned to the unit. One cardiologist who also acts as coordinator, 1 internist, 1 family physician (student doctor), 1 geriatrician, 1 rehabilitation physician, and 1 psychiatrist are employed part-time. The patients systematically attended the unit for at least 3 months, and then whenever it was necessary to change the dose of drugs or if the situation so required. Patients considered fragile (and, therefore, more susceptible to clinical events) according to the findings of the tests and geriatric assessment scales (Barthel scale, OARS, Pfeiffer scale, and abbreviated depression scale)[30] of any age were evaluated by the geriatrician, who decided the subsequent specific intervention required on each occasion. A rehabilitation program was established for patients with class III-IV heart failure. In this program, the patients were instructed on how to perform daily activities such as saving energy (class IV patients) and how to lighten respiratory work. A physical exercise program adjusted to the patients' needs was also followed for 4 months.

With a nursing questionnaire of our own design,[31,32] we investigated the change in some aspects of awareness and understanding of the disease and its treatment during the year of follow-up, as well as the level of self care and compliance of the patients. In a preliminary analysis, we saw that the efforts of the nurses to educate the patients only improved some of these aspects.[33] We analyzed some of the variables in the present study in which we saw a clear improvement and which could have affected the clinical course of our patients. We also analyzed and compared the pharmacological treatment of the patients before joining the unit with treatment during the first year of follow-up.

For the statistical analysis, we used the SPSS statistical package for Windows, version 11.0. The χ^2 test and Wilcoxon paired-sample test were used. Statistical significance was set at $P<.05$.

At all times, legislation on data privacy was observed in accordance with the tenets of the World Medical Association Declaration of Helsinki.

RESULTS

Between August 2001 and June 2003, 366 patients were admitted to the unit. The state of health and number of admissions for heart failure during the first year of follow-up were known for 362 patients, of whom 332 were still alive after 1 year of follow-up (73% men; mean age, 64.8 ±10.8 years). These patients formed the study population. Table 1 summarizes their clinical and demographic characteristics.

The number of admissions in the preceding year was 246, whereas during the year of follow-up 125 admissions were reported—a statistically significant reduction of 49% ($P<.001$). When patients were grouped into those not admitted, those admitted once, and those admitted more than once, the differences were also statistically significant: 184 patients were not admitted, 102 were admitted once, and 46 were admitted more than once in the preceding year, whereas during the year of follow-up, 275 were not admitted, 34 were admitted once, and 23 were admitted more than once ($P<.001$) (Table 2). The patient-by-patient (paired data) analysis also showed a highly significant difference ($P<.001$): 123 patients were admitted less often during the year of follow-up than in the preceding year, 179 were admitted the same number of times, and 30 patients were admitted more often in the follow-up year than in the preceding year.

Analysis of the highest risk group, that is, patients with more than 1 admission in the preceding year (n=47), showed that the decrease in admissions was even greater, dropping from 148 to 68, corresponding to a decrease of 54% ($P<.001$). Once again, when the patient-by-patient (paired data) analysis was done, the difference was also very significant ($P<.001$): 38 were admitted less often during the year of follow-up than in the preceding year, 4 were admitted the same number of times, and 5 patients were admitted more often during the year of follow-up than during the preceding year.

Comparative data are available from the nursing questionnaire for 298 of the 332 patients. Particularly noteworthy was a significant improvement during follow-up in the level of understanding of the disease, recognition of the signs of heart failure, knowledge of treatment, and some aspects of self care, such as weight and blood pressure control (Table 3). However, we did not see an improvement in dietary or treatment compliance, though initial compliance was already good (Table 3).

Figure shows the treatments taken by the patients before joining the unit and those taken during the year of follow-up in the unit.

TABLE 1. **Baseline Characteristics***

Number of patients	332
Men/women	244/88
Age, years	64.8±10.8†
Etiology	
Ischemic heart disease	200 (60%)
Dilated cardiomyopathy	34 (10%)
Hypertensive heart disease	28 (9%)
Alcoholic cardiomyopathy	21 (6%)
Toxic cardiomyopathy	3 (1%)
Valve disease	21 (6%)
Others	25 (8%)
Time course, months	24‡
NYHA functional class	
I	16 (5%)
II	169 (51%)
III	136 (41%)
IV	11 (3%)
Origin of patients	
Cardiology service	90 (27%)
Internal medicine service	39 (12%)
Cardiology outpatient clinic	160 (48%)
Internal medicine outpatient clinic	8 (2%)
Others	35 (11%)
Ejection fraction, %	32.5±12†
Hemoglobin <12 g/dL	90 (27%)
Renal impairment (creatinine >2.5 g/dL)	12 (4%)
Diabetes	124 (37%)
Hypertension	188 (57%)
Prior AMI	190 (57%)

*AMI indicates acute myocardial infarction; NYHA, New York Heart Association.
†Data expressed as mean ± SD.
‡Median.

DISCUSSION

Heart failure is currently one of the biggest health care problems in developed countries. Its prevalence is high and has been increasing in recent years.[34] Moreover, the condition is associated with high mortality and comorbidity. It is also an important cause of admission to hospital, accounting for more than

TABLE 2. **Admissions for Heart Failure per Patient in Preceding Year and During the Year of Follow-up**

Patients (N=332)	Preceding Year	Year of Follow-up	*P*
			<.001
No admissions for heart failure	184 (55%)	275 (83%)	
One admission for heart failure	102 (31%)	34 (10%)	
More than 1 admission for heart failure	46 (14%)	23 (7%)	
2 admissions	24 (7%)	12 (3.5%)	
3 admissions	11 (3.5%)	5 (1.5%)	
>3 admissions	11 (3.5%)	6 (2%)	

TABLE 3. **Differences in Various Educational and Self-Care Aspects***

Patients (N=298)	Initial Visit %	Visit After 1 Year %	*P*
Aware of and understand the disease			<.001
Well	28	55	
Fairly well	36	32	
Somewhat	29	11	
Not at all	7	2	
Aware of warning signs of heart failure			<.001
>3	66	86	
1-3	31	13.5	
None	3	0.5	
Aware of the action of the pills being taken			<.001
100%	24	44	
75%	32	22	
50%	13	13	
≤25%	31	21	
Weighing			<.001
> Once a week	13	15	
Once a week	8	24	
1-2 times a month	16	45	
Only at visits	63	16	
Blood pressure reading			<.001
>Once a week	16	15	
Once a week	12	28	
1-2 times a month	27	45	
Only at visits	45	12	
Follow a salt-free diet			NS
Always	33	21.5	
Almost always	42	59	
Sometimes	18	17	
Almost never or never	7	2.5	
Take medication			NS
100%	92	88	
75%	6	9	
50%	1	2	
≤25%	1	1	

*NS indicates not significant.

5% of medical hospitalizations in adults.[1] The cost of heart failure accounts for between 1% and 2% of health budgets in developed countries. Most of this cost is derived from admissions to hospital, as hospital stays are usually long and their number increases progressively as the disease progresses.[1] In Spain, mean hospital stays range from 9.5 days to 13 days, though stays in cardiology services are lower—6.3 days.[35]

A variety of effective drugs are available, but they are not always used appropriately or they are underused, particularly in the case of beta-blockers. Titration to higher doses is needed, and the introduction of such treatments requires several visits over a short period even if no problems arise. Patients with heart failure often require changes in treatment in response to disease progression, thus successive and frequent visits are needed. Furthermore, many of the treatments prescribed for heart failure have side effects. Awareness of these effects and an appropriate management of treatments can save unnecessary admissions to hospital and also ensure a closer monitoring of the patients' treatment compliance.

Administration of treatment and monitoring of the patients with heart failure are therefore improved if done by specialized staff in a suitable readily accessible unit. Ever since Cintron et al[9] studied the usefulness of a heart failure unit run by the nursing service in 1983, different types of "unit," "clinic," or "programs" to organize care for patients with heart failure have become more widespread. The interventions (monitoring and/or treatment) that can be undertaken in these "units" or "programs" have been shown to decrease the number of admissions to hospital (sometimes by as much as 87%), the length of hospital stay, and visits to the emergency room,[8-29] with the corresponding savings for the hospital. Such "units"

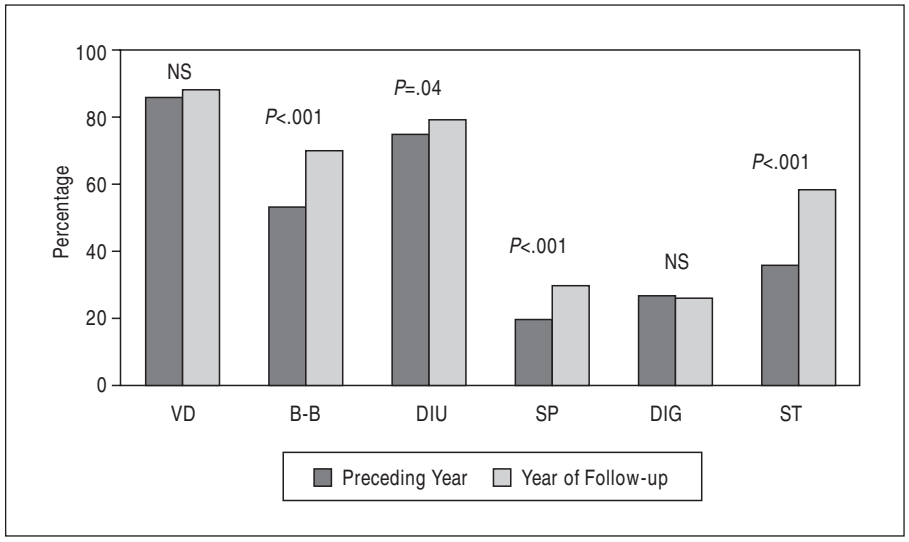

Figure. Treatments taken before attending the unit and during the year of follow-up for all patients. BB indicates beta-blockers; DIG, digoxin; DIU, loop diuretics; SP, spironolactone; ST, statins; VD, vasodilators (angiotensin-converting enzyme inhibitors + angiotensin II receptor antagonists).

or "programs" have also been shown to improve the quality of life of the patients, increase treatment compliance, improve self care, and even lengthen survival.[21-23] Preliminary results suggest that such benefit is also possible in Spain.[24,25] The benefit in terms of hospital admission has been seen for all types of "heart failure program," regardless of whether the program involves home visits and/or telephone contacts by the nursing service to educate and support the patients,[14,19,22,29] or whether the care is given within a specialist unit[10,15,24] or in a coordinated mixed unit of primary/specialist care.[17,28] Benefits have been seen both in consecutive studies such as ours[9,11,12,14-16] and in randomized studies.[13,17,19-21,24,25,28,29] The decrease in the number of admissions varies widely, with reductions between 36% to 87%, though most studies put the decrease between 40% and 50%. Our findings therefore lie within an acceptable range. Often, it is possible to reduce the mean hospital stay,[9,11,13,20-22,24] but we do not have any data to confirm this.

It is hard to determine which components of "specialist" care are important for reducing admissions to hospital, as the true roles of each component of the interventions in such "specialist" care are not well established. The COACH study,[36] which is currently ongoing, aims to investigate the contributions of each component. In our case, we think that there are 3 main components that contributed to our findings. One of these was the improvement associated with the degree of awareness of certain aspects of the disease and its treatment which, together with better self care, particularly with respect to weight control, allowed a flexible regimen of diuretics to be established in many patients. This on its own probably contributed to a decrease in admission to hospital. The second component is the greater accessibility of a unit such as ours. With this ready accessibility, we were able to change or adjust treatment earlier during the initial stages of heart failure and so the clinical state of the patient could be improved before admission was required.

We also did not see any improvement in dietary or treatment compliance in our patients. Thus, this important aspect of management of patients with heart failure did not contribute to the benefit observed in the reduction of admissions in our population. However, we have already stated that initial compliance was good, and if compliance had been worse to start with, its improvement would have contributed to the goal of reducing the number of admissions.

Finally, we believe that a more generous use of drugs shown to reduce admissions to hospital, in particular beta-blockers and spironolactone, also played an important role. The percentage of patients on beta-blockers increased from 53% to 70% ($P<.001$) and that of patients on spironolactone from 20% to 30% ($P<.001$). The initial percentage of patients on beta-blocker treatment was already high. This is clearly related to the origin of these patients, 75% of whom were referred from the cardiology outpatient clinic or from the cardiology service. The prescription of statins increased (from 36% to 58%; $P<.001$), which is also an important consideration as ischemic heart disease was the cause of heart failure in 60% of the patients.

Study Limitations

Although we studied a general population with heart failure attended in a specific multidisciplinary heart-failure unit belonging to a tertiary hospital, our patients nevertheless represented a selected group of patients with heart failure—most were referred from the cardiology service, there were more men than women, heart failure was caused by ischemia, and they were relatively young. Therefore, the results obtained cannot necessarily be extrapolated to the overall population with heart failure.

The study only took into account admissions to hospital due to heart failure, but it was difficult to confirm the reason for admission if no report was available. This possible limitation would, however, be applicable both to admissions during the preceding year and to those that occurred during the first year of follow-up, and so we do not think that it influenced the final results. Moreover, relatively few patients (<5%) did not have any admission report. We also did not analyze admissions to the emergency room alone. Such admissions would have been difficult to count and check because information was lacking and patients did not always remember how long they had spent in the emergency room, especially in the year preceding admission to the unit. We cannot be sure that the approach taken in the emergency room for patients with heart failure remained strictly the same, though we did not see any major changes in the treatment that the patients received or in the admission criteria during the 2 years of the study.

Finally, the patients in our study were consecutive and not randomized, and such an analysis may overestimate the benefit of the intervention.

CONCLUSIONS

The number of hospital admissions for heart failure among patients who received attention at our unit was significantly less in the first year of follow-up than in the year preceding attendance. This reduction was probably due to educational and pharmacological interventions and to a closer monitoring.

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