One-year follow-up of heart failure patients after their first admission

F. FORMIGA, D. CHIVITE, N. MANITO1, V. OSMA, S. MIRAVET and R. PUJOL

From the Geriatric Unit, Internal Medicine Service, and 1 Cardiology Service, Hospital Universitari de Bellvitge, L’Hospitalet de Llobregat, Barcelona, Spain

Received 14 October 2003 and in revised form 28 November 2003

Summary

Background: Outcomes related to heart failure remain relatively poor.

Aim: To examine the clinical course of patients for one year after their first admission because of heart failure, including prognosis, mortality, and rehospitalization.

Design: Prospective observational study.

Methods: Of 121 patients hospitalized over 6 months for decompensation of previously unknown heart failure, we excluded those with a possible previous diagnosis of heart failure (n = 5), who suffered from another serious disease with a poor prognosis (n = 6), died during the index hospitalization (n = 5), refused to participate (n = 4) or were lost to follow-up (n = 6). Mortality and readmissions were identified by prospective follow-up of all patients.

Results: Of the 98 patients evaluated, half (49) were women. Mean ± SD age was 75.2 ± 12 years. The 1-year case-fatality rate after the first admission was 24%; 19% of the deaths were heart failure-related, with progressive pump failure the predominant cause (14% of the total). Age was the only factor associated with increased mortality (p < 0.007). Of the 74 survivors, 32% experienced at least one hospital readmission during follow-up.

Discussion: The prognosis of unselected new cases of heart failure after their first hospitalization remains relatively poor, despite recent advances in pharmacological therapy and medical care.

Introduction

Heart failure is increasing in prevalence, incidence and mortality among elderly people,1 and its burden will continue to increase substantially over the next two decades.2 Although over the past 50 years, survival after the onset of heart failure has improved in both sexes,3 modern therapies for this disease slow, but cannot stop, its progression. The clinical course of heart failure, and the quality of life of affected patients, are difficult to predict.4

Heart failure is the most common hospital discharge diagnosis for patients aged 65 and older.5 Patients with heart failure are at high risk of readmission to hospital6,7—recent data suggest that almost a third of the patients discharged alive after a episode of decompensation are readmitted because of the same problem within 6 months.5 Jong et al. recently reported a poor prognosis for patients newly hospitalized for heart failure,8 but the majority of the studies5,9,10 concerning the prognosis of heart failure have not eliminated the confounding effect of disease duration, or are based on randomized clinical trials11,12 with participants who often do not reflect the true clinical picture of the common heart failure patient.

We undertook the present study to evaluate the clinical course and prognosis of unselected patients.
newly hospitalized because of decompensated heart failure who had never been given such a diagnosis previously as out-patients—i.e. incident or debut heart failure patients. A second objective was to assess the percentage of patients who were examined by echocardiography and placed on chronic therapy with angiotensin-converting enzyme (ACE) inhibitors or beta-blockers, both upon discharge from the incident hospitalization and after one year of follow-up.

**Methods**

**Patient selection**

During the second 6 months of 2001, all patients who were consecutively admitted from the Emergency Unit to the Internal Medicine and Cardiology wards of our hospital, with the main diagnosis of decompensated heart failure, were prospectively evaluated. To be selected for inclusion in the study, all these patients had to be assessed within 24 h of admission by the study investigators to confirm the diagnosis of heart failure, and to determine that the current episode was the first manifestation of the disease—i.e. the diagnosis of heart failure was previously unknown to the patients. Heart failure cases were defined according to the Framingham criteria and the presence of signs of left heart failure or cardiomegaly in the admission chest X-ray.13 We excluded patients in whom previous assessments or treatments elsewhere could have been related to a prior diagnosis of heart failure (n = 5) and those suffering from other serious diseases with a poor mid- to short-term prognosis (n = 6). Patients who died during the index hospitalization (n = 5), those who refused to participate (n = 4) and those who were lost to follow-up (n = 6) were also excluded. Overall, 98 patients were included. The baseline characteristics (age, sex and comorbidities) of the excluded patients and non-participants did not differ significantly from those of the participating patients. The institutional ethics committee of our hospital approved the study, and all patients gave their written informed consent before enrolment.

**Data collection**

Collected data included: demographic data (age, gender, place of residence), past medical history (cardiovascular and non-cardiovascular diseases), and the clinical data at the time of Emergency Room admission. Functional status at the time of admission was assessed using the New York Heart Association (NYHA) classification. The basic diagnostic evaluation included an electrocardiogram, a chest radiograph, a complete blood count and the usual blood chemistry values in all patients. A transthoracic echocardiogram was performed only when deemed necessary by the physicians who were directly responsible for the care of the patients during their hospital admission. Left ventricular systolic function was classified as indeterminate (not assessed), normal (ejection fraction ≥ 50%) or reduced (ejection fraction < 50%).14 The Charlson score was used to measure comorbidity—this score ranges from 0 to a theoretical maximum of 33, depending on the presence of certain diseases with pre-specified values.

During the index admission, the patients were not managed according to specific protocols. At the time of hospital discharge, all medications prescribed were recorded.

**Outcome variables**

Mortality and readmissions were identified by prospective follow-up of all patients. Death, its presumed cause and all unplanned readmissions because of symptomatic heart failure or other cardiovascular reasons were assessed at 30 days and 1 year after the index admission—admissions due to causes unrelated to heart failure or other cardiovascular events were not included in the analyses. Mode of death was classified as: (a) refractory, progressive heart failure; (b) other cardiac events such as an acute myocardial infarction or ventricular tachyarrhythmias; (c) multifactorial (heart failure and at least an additional non cardiovascular disease); and (d) sudden death (when a patient with stable haemodynamics was found dead with no apparent cause).6 The use of ACE inhibitors and beta-blockers upon discharge and at the end of the follow-up period was also recorded.

**Data analysis**

Survival was estimated using the Kaplan-Meier method for all-cause mortality. Normally distributed continuous variables are reported as mean ± SD. Categorical variables are reported as proportions. In bivariate analyses, Student's t test was used to compare continuous normally distributed variables, and the $\chi^2$ statistic or Fisher's exact test for the comparison of categorical or dichotomous variables.

The following variables were included in the univariate analyses: age, gender, aetiology of heart failure, NYHA status upon admission, left ventricular systolic function, systolic and diastolic blood pressure, heart rate, sinus rhythm, haematocrit and serum creatinine. The relationship between
these measures and mortality or new hospitalization directly related to heart failure was investigated using multivariate models. Those who died of non-cardiovascular causes were censored at the time of death. Tests for significance were two-tailed; \( p < 0.05 \) was considered significant. SPSS v 10.0 + for Windows (SPSS Inc) software was used for the analyses.

### Results

Among the 98 patients hospitalized for the first time for heart failure who were finally included, there were 49 women and 49 men. Mean age was \( 75.2 \pm 12 \) years (range 40–96). Mean length of stay during the first admission was \( 9.9 \pm 12 \) days (range 3–75). Table 1 shows their clinical features. The single most common cause of heart failure was presumed to be coronary heart disease (34% of all patients). All patients were symptomatic at the time of hospital admission: NYHA status was II in 5%, III in 28% and IV in 67%. Median Charlson score was \( 2.2 \pm 1.2 \) (range 0–7). All but six patients, who were already placed in nursing homes, lived in the community before the index admission. Thirty percent reported a current or past history of smoking. Sixty-one had their left ventricular function assessed by echocardiography at some time during the index admission; ejection fraction values were reduced (<50%) in 49%.

### Survival

Mortality during the first year was 24%. Cumulative survival was 95% at one month, and 76% at one year (Table 2). Figure 1 depicts the survival curve for the entire cohort of patients. The majority of deaths \( (n = 19) \) were related to heart failure; either because of refractory, progressive disease \( (n = 14) \) or because of new cardiac events or sudden death \( (n = 5) \). Only in 5 patients was death not attributable to heart failure, but to another associated disease.

Only age \( (p < 0.007) \) was associated with increased mortality. Neither gender \( (p = 0.8) \), comorbidity \( (p = 0.3) \), ejection fraction \( (61 \) patients, \( p = 0.3) \), admission systolic \( (p = 0.3) \) or diastolic

### Table 1  Clinical features of 98 patients hospitalized with a first diagnosis of heart failure

<table>
<thead>
<tr>
<th>Feature</th>
<th>Number/value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>75.2</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>49</td>
</tr>
<tr>
<td>Women</td>
<td>49</td>
</tr>
<tr>
<td>Aetiology</td>
<td></td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>34</td>
</tr>
<tr>
<td>Undetermined</td>
<td>12</td>
</tr>
<tr>
<td>Valve disease</td>
<td>14</td>
</tr>
<tr>
<td>Hypertension</td>
<td>31</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>NYHA class</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>5</td>
</tr>
<tr>
<td>III</td>
<td>27</td>
</tr>
<tr>
<td>IV</td>
<td>66</td>
</tr>
<tr>
<td>Mean systolic blood pressure (mmHg)</td>
<td>158</td>
</tr>
<tr>
<td>Mean diastolic blood pressure (mmHg)</td>
<td>87</td>
</tr>
<tr>
<td>Mean heart rate</td>
<td>97</td>
</tr>
<tr>
<td>Sinus rhythm</td>
<td>59%</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>31%</td>
</tr>
<tr>
<td>Mean serum creatinine (( \mu )mol/l)</td>
<td>1.2</td>
</tr>
<tr>
<td>Mean haematocrit</td>
<td>37</td>
</tr>
<tr>
<td>Qualitative assessment of left ventricular systolic function ( (n = 61) )</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>51%</td>
</tr>
<tr>
<td>Impaired</td>
<td>49%</td>
</tr>
</tbody>
</table>

Data are numbers excepted where otherwise indicated.

- Figure 1. Survival of newly diagnostic cases of heart failure patients after the first admission.
blood pressure ($p = 0.9$), heart rate ($p = 0.11$), sinus rhythm ($p = 0.1$), creatinine ($p = 0.9$) haematocrit values ($p = 0.6$), admission NYHA status ($p = 0.4$), nor aetiology of heart failure ($p = 0.7$) were associated with increased mortality. Furthermore, no significant association was found between death and the prescription of ACE inhibitors ($p = 0.4$) or beta-blockers ($p = 0.6$) at the time of discharge.

**New hospital admissions related to decompensated heart failure**

At the end of the follow-up period, 32% of the 74 patients who survived experienced at least one unplanned admission because of worsening of their heart failure (27 admissions in 23 patients). No association was found between readmissions and age ($p = 0.7$), gender ($p = 0.8$), comorbidity ($p = 0.5$), ejection fraction ($p = 0.6$), systolic blood pressure ($p = 0.05$), diastolic blood pressure ($p = 0.1$), heart rate ($p = 0.9$), creatinine ($p = 0.9$), haematocrit ($p = 0.8$), NYHA status ($p = 0.1$), sinus rhythm ($p = 0.6$) or aetiology ($p = 0.6$).

**Use of ACE inhibitors and beta-blockers among patients who completed the follow-up**

At the time of discharge, 35 patients had been prescribed ACE inhibitors and nine patients beta-blockers. After one year, there was a significant increase in the ACE inhibitor prescription rates (50 vs. 35 patients, $p = 0.02$), but not for beta-blockers (15 vs. 9; $p = 0.2$). Of the patients with documented systolic dysfunction, 75% were taking ACE inhibitors and 42% beta-blockers at the end of the follow-up period.

**Discussion**

An admission for heart failure is frequently followed by readmission within a short period of time. Although we report a significant readmission rate due to worsening heart failure, 68% of our patients remained free from further hospitalizations for one year after the index admission; similar results (76% event-free survival) were reported by Cowie et al. We did not identify any predictors, not even age, associated with the need for readmission in our cohort of newly diagnosed patients.

The 1-year case fatality rate in new-onset heart failure in large-scale studies ranges from 20% to 45%, although the figures are lower when only younger patients or the highly selected cohorts participating in clinical trials are considered (for instance, the 1-year mortality rate in the intervention arm of the SOLVD study was as low as 12%). The risk of mortality in patients with a new diagnosis of decompensated heart failure seems to be higher in the first few weeks after the initial diagnosis. In a population-based cohort study of incident heart failure cases (both hospitalized or ambulatory) the authors found that survival was 81% at 1 month after the diagnosis, 75% at 3 months, 70% at 6 months and 62% at one year. We report similar figures, although the fatality rates are slightly better for the periods considered. Several factors may contribute to this finding among elderly heart failure patients, including variations in underlying cause of the disease, the high prevalence of comorbid conditions, medication underuse and reduced responsiveness or tolerance to usual treatments.

Cowie et al. reported that age, functional class and serum creatinine were predictive of higher mortality. In another study including 38 702 patients, the crude fatality rate was higher for patients with advanced age, male sex, and greater comorbidity, such that the simultaneous presence of other comorbid conditions (as identified by higher Charlson scores) was a significant independent predictor of 30-day and 1-year mortality. However, we were unable to confirm this association in our patients.

Previous studies have provided conflicting observations regarding the relative prognosis for women and men with heart failure. One study reported that mortality was lower for older women (> 64 years) and higher for younger women, when compared with their male counterparts. We did not find such differences.

Senni et al. reported the presence of a preserved ejection fraction in the 43% of the patients with heart failure. In older patients, heart failure is often associated with a normal left ventricular function. Prognosis in heart failure patients with preserved normal systolic function seems to be better than that for those with depressed function. In our study, a slightly higher percentage of patients with preserved ventricular systolic function was noted; however, we did not find a statistical association between higher mortality and the type of systolic function. This finding may be related to the inclusion of only incident cases, or to the small number of patients in whom echocardiographic data was available.

In clinical trials, case fatality related to heart failure has been significantly reduced by the implementation of therapies such as ACE inhibitors or (more recently) beta-blockers. ACE inhibitor prescription usually decreases with age (from 58.9%
References


