2007 National Registry of Admissions due to Heart Failure

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SUMMARY
Introduction
Heart failure represents one of the main causes of hospital admissions, with a high rate of complications; however, its approach does not seem to have improved during recent years.

Objectives
To become acquainted with the epidemiological and clinical profile; to analyze the therapeutic measures and the evolution of patients who were admitted due to decompensated heart failure, during the period of hospitalization, and three months later.

Material and Methods
Prospective multicenter register of hospitalized patients due to decompensated heart failure in 31 facilities throughout the country that accepted the invitation to participate in the register. Variables related to the presentation and the hospital evolution were analyzed, as well as the variables 90 days after hospitalization.

Results
A total of 736 patients were included, with an average of 74 years of age (64-82), 41% women, 75% hypertensive, 27% diabetics, 20% previous infarction, 30% chronic atrial fibrillation, 17% chronic kidney failure, 18% COPD. Only 29% was of ischemic-necrosis etiology. 47% had been admitted over the last year due to heart failure. The most frequent causes of decompensation were infections, stopping treatment, and dietary indiscretion. The severe presentations (cardiogenic shock, acute pulmonary edema, anasarca) occurred in 30% of the individuals. 60% patients were admitted in the critical unit. The median stay in hospital was of 7 (5-11) days. In-hospital mortality was of 8%. After 90 days, readmittance was of 24.5%, and post discharge mortality was of 12.8%.

Conclusions
The present registry confirms that this is a population made up of older adults with a high incidence of co-morbidities. Many decompensations occur due to factors that may be prevented. The rate of complications is high and did not reduce over the last decade.


Keywords
Heart Failure - Hospitalization - Mortality

Abbreviations
ECG Electrocardiogram
COPD Chronic obstructive pulmonary disease
DHF Decompensated heart failure
PAMI Programa de Atención Médica Integral
SAC Argentine Society of Cardiology
SBP Systolic blood pressure

BACKGROUND
Heart failure is a disease that is growing in prevalence and incidence, producing a significant reduction in life expectancy and impairment in quality of life. Approximately one out of five patients with heart failure needs to be hospitalized at least once a year.

According to statistics of the United States, the rate of admissions due to heart failure increased by 175% from 1979, and currently more than one million patients are discharged each year with a diagnosis of decompensated heart failure (DHF). (1)

Hospitalization clearly represents worsening of the progression of the disease. Patients discharged after hospitalization due to DHF have increased risk of
mortality compared to ambulatory HF patients (2), with mortality and readmission rates of about 35% at 60 days. (3) About 60% of costs due to heart failure are consumed during hospitalization. (1)

Progress in treatment options for cardiovascular diseases in general, and for heart failure in particular, has produced an evident prognostic benefit. Unfortunately, outcomes of patients with DHF have not improved. The greatest incidence of DHF has not been followed by effective therapeutic options, as proved by the absence of positive outcomes in terms of reduction in mortality or rehospitalization.

In 1999 (4) and 2002 (5) the Argentine Society of Cardiology (SAC) performed registries of DHF. Five years after the last registry, the Council on Cardiovascular Emergency Care together with the Research Area of the SAC decided to carry out a new survey in order to know the epidemiological and clinical profile of patients currently hospitalized due to heart failure, and to analyze the treatments prescribed and the outcomes during hospitalization. This is the first registry to perform follow-up of patients 90 days after admission in order to assess rehospitalization and survival.

MATERIAL AND METHODS

We performed a multicenter and prospective registry of consecutive patients > 18 years, hospitalized with heart failure between March and September 2007 in 31 centers of Argentina that agreed to participate. The Research Area and the Inland Area of the SAC invited all medical centers nationwide related with the scientific society to participate in the survey.

The diagnosis of heart failure included the presence of signs and symptoms suggestive of the disease according to the investigator’s opinion, with absence of strict diagnostic criteria.

Patients with heart failure complicating acute myocardial infarction and postoperative heart failure after cardiac and non cardiac surgery were excluded.

The following variables were analyzed: clinical presentation, in-hospital outcomes, clinical status at discharge, diagnostic procedures and treatments prescribed during hospitalization. Ninety days after leaving hospital, patients were contacted by phone call to register rehospitalization and survival. Creatinine clearance was determined by the Cockroft-Gault formulation.

Coronary etiology was defined as history of myocardial infarction or coronary revascularization procedure or when an investigator considered that etiology in a patient with history of coronary angiography and significant coronary lesions.

Statistical Analysis

Quantitative variables with parametric and non-parametric distribution were presented as mean and standard deviation, or median and interquartile range, respectively, and were analyzed using Student’s t test and Wilcoxon test for comparisons between two groups, respectively. ANOVA and Kruskal-Wallis test were used for comparisons among three groups or greater, respectively. Qualitative variables were expressed as percentages, and chi square test was used to determine statistical significance. Odds ratio (OR) with its corresponding 95% confidence interval (CI) was also calculated. A two-tailed p value < 0.05 was considered statistically significant. All variables with p < 0.10 in univariate analysis underwent multivariate analysis to establish independent predictors. All calculations were performed using Epi-Info and Statistix software package.

RESULTS

Patients’ basal characteristics are displayed in Table 1. A total of 736 patients from 31 centers were registered. Median age was 74 years (64-82); 41% were women (median age 77.5 years [69-89]) and 59% were men (median age 72 years [61-78]). Seventy six percent of patients had hypertension and 27% were diabetics. About 20% to 30% of patients had a history of myocardial infarction, valvular heart disease or chronic atrial fibrillation. Comorbidities, such as COPD and renal failure, were present in almost 50% of participants. Two-third of patients had a history of heart failure and 47% had been admitted for heart failure in the previous year. Approximately half of the patients were on loop diuretics and angiotensin-converting enzyme inhibitors, and 25% were receiving beta blockers.

<table>
<thead>
<tr>
<th>Table 1. Basal characteristics</th>
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<tbody>
<tr>
<td><strong>n</strong> = 736</td>
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<tr>
<td>Age (years)</td>
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<tr>
<td>Female gender</td>
</tr>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Previous infarction</td>
</tr>
<tr>
<td>Valvular heart disease</td>
</tr>
<tr>
<td>Cardiac resynchronization</td>
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<tr>
<td>Chronic AF</td>
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<tr>
<td>Chagas disease</td>
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<tr>
<td>Comorbidities</td>
</tr>
<tr>
<td>COPD</td>
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<tr>
<td>Previous kidney failure</td>
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<tr>
<td>History of HF</td>
</tr>
<tr>
<td>Systolic dysfunction</td>
</tr>
<tr>
<td><strong>Previous treatment:</strong></td>
</tr>
<tr>
<td>Loop diuretics</td>
</tr>
<tr>
<td>ACEI</td>
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<td>Beta blockers</td>
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<td>Spironolactone</td>
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</table>
Médica Integral (medical retirement plan) 13%, prepaid medical insurance 33%. Sixty one percent of patients were admitted to the coronary care unit or intensive care unit and the rest of the patients were hospitalized in cardiology or internal medicine wards.

Figure 1 shows the most frequent causes of DHF: infections, hypertensive crisis, dietary transgression and treatment discontinuation. Other factors, such as arrhythmias and acute coronary syndromes, were less prevalent.

Clinical and electrocardiographic findings and lab tests results at admission are detailed in Table 2. Half of the patients had SBP levels greater than 130 mm Hg and heart rate greater than 90 beats per minute. Creatinine clearance was estimated in 538 patients; in 50% it was < 50 ml/min.

The less severe clinical presentations - simple pulmonary congestion and systemic congestion - were most prevalent (39.7% and 31.3%, respectively). The most severe presentations included acute pulmonary edema (18.3%), cardiogenic shock and anasarca (5.3% each).

Figure 2 illustrates the different treatments. Angiotensin-converting enzyme inhibitors were prescribed in 66.7% of patients, beta blockers in 60.5%, furosemide in 92.1%, nitroglycerin in 29.8% and sodium nitroprusside in 4.2%. Inotropic drugs were prescribed to 19.2% of patients due to the following conditions: shock/hypotension in 59.4%, oliguria or absence of response to therapy with diuretics in 38%, and sepsis or routine treatment in the remaining patients. Dopamine was the inotropic agent more frequently used (12.9%), followed by dobutamine (10.6%); the use of norepinephrine (3%), levosimendan, milrinone and epinephrine was less frequent.

**Hospital Course**
Patients were hospitalized for a median of 7 days (5-11). In-hospital mortality was 8%. Independent predictors of mortality were female gender, history of previous hospitalization, left bundle branch block in the ECG, peripheral hypoperfusion, elevated number of white blood cells and hyponatremia (Figure 3).

### Table 2. Findings at admission

<table>
<thead>
<tr>
<th>Physical examination</th>
<th>SBP (mm Hg)</th>
<th>134 ± 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBP (mm Hg)</td>
<td>77 ± 17</td>
<td></td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>92 ± 24</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>20</td>
<td></td>
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<tr>
<td>Lab tests</td>
<td></td>
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<tr>
<td>Hematocrit (%)</td>
<td>38 ± 6</td>
<td></td>
</tr>
<tr>
<td>White blood cells /mm³</td>
<td>9,040 ± 3,540</td>
<td></td>
</tr>
<tr>
<td>BUN (mg/dl)</td>
<td>61 ± 32</td>
<td></td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>1.42 ± 0.72</td>
<td></td>
</tr>
<tr>
<td>Plasma sodium (mEq/L)</td>
<td>136 ± 6</td>
<td></td>
</tr>
<tr>
<td>Glycemia (mg/dl)</td>
<td>139 ± 68</td>
<td></td>
</tr>
<tr>
<td>ECG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinus rhythm (%)</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation/flutter (%)</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Left bundle branch block (%)</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Abnormal Q waves (%)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>LVH (%)</td>
<td>15</td>
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</tr>
</tbody>
</table>
Mortality rate of the 449 patients admitted to a critical care area (39% with severe disease) was 11.1%, and 3.14% in the 287 patients hospitalized in wards of cardiology or internal medicine (13.6% with severe disease). Death rates according to clinical presentation were as follows: systemic congestion 3.9%, simple pulmonary congestion 5.1%, acute pulmonary edema 9.6%, anasarca 10.5% and shock 43.9%.

Follow-up after 90 days was achieved in 89% of patients. In these 595 patients, 146 were rehospitalized (24.5%) and 76 patients died (12.8%).

**DISCUSSION**

The progressive increase in hospitalizations due to heart failure has generated the necessity to identify the own characteristics of this disease in order to allow a better approach of the problems associated with this condition.

Interventional studies have supplied valuable information; however, they are biased as patients enrolled in clinical trials are usually younger, with less comorbidities, more frequently men, and with systolic dysfunction. (6) In this sense, registries have less strict criteria of inclusion and allow to make decisions based on the real world of patients hospitalized.

Our study coincides with international registries, (7-9) reflecting that patients hospitalized due to heart failure are an heterogeneous and elder population, with severe comorbidities such as diabetes mellitus in 25% of patients, COPD, renal failure, and hypertension which is the most prevalent condition, present in 3 out of 4 patients. The prevalence of patients with systolic dysfunction is slightly greater than the observed in other registries.

These data highlight the importance of an encompassing approach of therapies that should include correction of comorbidities and avoid adverse events of treatments.

The great incidence of hypertension reflects the importance of preventing heart failure from stage A of the disease according to the classification of the AHA-ACC. (10) The prevalence of hypertension was greater compared to previous registries in our country. (11)

However, coronary artery disease was less frequent than in other intervention studies (approximately 50%), (3) a similar finding to that of registries from other countries. (12, 13) Although this difference might be attributed to underreporting, it might also be related to the high proportion of patients that are hospitalized with de novo heart failure which is frequently secondary to hypertensive crisis. When we analyze only the population with known systolic dysfunction, the prevalence of ischemic cardiomyopathy is about 50%.

Patients with Chagas disease were only 4%. This might be explained either by the fact that patients enrolled in the study did not come from endemic areas or by underreporting, as screening for Chagas disease was not performed systematically.

The proportion of patients with medical coverage (excluding patients under PAMI coverage) -either by social security or prepaid medical insurance - was high (>70%); surprisingly, the rate of DHF due to treatment discontinuation, dietary transgression and hypertensive crisis was elevated (40%). These factors are related to strict follow-up and clear guidelines to achieve treatment compliance. Once again, infections are frequent causes of decompensation, thus prophylaxis with influenza and pneumococcal vaccination is important. (14)

In 20% of patients is was not possible to identify a precipitating factor for decompensation; this is interesting from a physiopathological point of view insofar as disease progression.

Although only 30% of patients were hospitalized with severe clinical presentations (cardiogenic shock,
anasarca and acute pulmonary edema), 60% of them were admitted to intensive care areas. Interestingly, mortality of patients admitted to a critical care area was greater even though they had not been labeled high risk patients, suggesting the presence of subjective components that are not considered for categorizing the severity of heart failure on presentation.

The use of beta blockers and angiotensin-converting enzyme inhibitors has increased compared to previous SAC registries and is similar to the one published in the ADHERE registry. (15) The use of inotropic agents was similar to previous registries. Dopamine and dobutamine were used more frequently than the other new inotropic agents, probably due to economic reasons and to the lack of evidence of superiority. (16)

In-hospital mortality was somehow lower than that of other SAC registries (10.5% in 1999 [4] and 8.9% in 2002 [5]); however, these differences were not statistically significant. Hyponatremia is an independent predictor of mortality according to SAC registries and international registries as the ADHERE. (15) Hypotension and renal dysfunction were markers of greater risk in the ADHERE registry. (17) In our registry, both variables were predictors of high risk only at univariate analysis, but not at multivariate analysis; this difference might be related to the presence of peripheral hypoperfusion which was frequent and included the other variables. The presence of hypoperfusion is an expression not only of greater hemodynamic compromise but also of use of inotropic agents and high doses of diuretics, and both interventions are associated with worse outcomes. (18-20) Left bundle branch block was not reported as a predictor of in-hospital mortality. It might express worse systolic dysfunction or play a role as a determinant of mortality due to dyssynchrony. Although ventricular function was not an independent predictor of adverse in-hospital outcomes in the current registry and in previous SAC registries, it might be due to the number of patients included.

Leukocytosis at admission was a marker of high risk, probably due to the fact that it was present in patients with infections who had poor outcomes. However, when patients in whom an infection was considered a precipitating factor were excluded (n = 119), leukocytosis remained as a predictor of high risk, emphasizing the importance of inflammation as determinant of outcomes during hospitalization. Finally, mortality was greater among women. This finding had not been described in previous SAC registries or in the ADHERE registry. In our registry coronary artery disease was less frequent among women; however, compared to men, they were older, with better renal function, lower hematocrits and greater incidence of pulmonary congestion (66% versus 51% in men). Possibly, adverse outcomes might be related to unregistered factors; yet we believe that prognostic value of gender should be validated in future registries.

This is the first SAC registry to include late follow-up after discharge in patients with DHF. This information allows us to confirm that decompensation represents a clear worsening of the conditions of the disease; its consequence is not limited to the duration of hospital stay, and implies high rates of rehospitalization and mortality early after discharge.

In this sense patients should be discharged with clear recommendations, at dry weight or at least marked improvement of his/her condition. Precipitating factors may persist despite initial favorable response to treatment.

**Study Limitations**

This registry was not intended to be, and should not be relied as representative of the real world of decompensated heart failure in Argentina. The participants, related with the SAC, were invited to take part in the survey; thus they were not selected at random and homogeneously through the whole country. Anyway, we understand that the reality of the nation is very difficult to interpret due to the presence of a pronounced heterogeneity among the different regions.

This is the first registry of DHF developed in our environment that includes late follow-up. Although a follow-up rate of 89% is not ideal, it reflects the difficulties of even highly motivated investigators to find unselected patients.

**CONCLUSIONS**

The present registry confirmed that patients hospitalized due to heart failure are older, with high incidence of comorbidities. Almost half of them had been hospitalized in the previous year and 25% was readmitted within 3 months. The results of this registry are similar to those of previous registries.

 Decompensated heart failure represents a severe public health problem, and in the light of the results obtained, the reality of hospitalization does not seem to have modified substantially in the last 8 years.

**RESUMEN**

Registro Nacional de Internación por Insuficiencia Cardíaca 2007

**Introducción**

La insuficiencia cardíaca representa una de las principales causas de internación con una tasa elevada de complicaciones y cuyo enfoque no parece que haya mejorado en los últimos años.

**Objetivos**

Conocer el perfil epidemiológico y clínico, analizar las medidas terapéuticas y la evolución durante la internación y a los 3 meses de pacientes admitidos por insuficiencia cardiaca descompensada.
Material y métodos
Registro prospectivo, multicéntrico de pacientes internados por insuficiencia cardiaca descompensada en 31 centros de todo el país que aceptaron la invitación a participar del registro. Se analizaron variables vinculadas con la presentación y la evolución hospitalaria y a los 90 días.

Resultados
Se incluyeron 736 pacientes, mediana de edad 74 años (64-82), 41% mujeres, 75% hipertensos, 27% diabéticos, 20% infarto previo, 30% fibrilación auricular crónica, 17% insuficiencia renal crónica, 18% EPOC. Sólo el 29% era de etiología isquémico-necrótica. El 47% había tenido internación en el último año por insuficiencia cardíaca. Las causas de descompensación más frecuentes fueron infecciones, suspensión del tratamiento y transgresión alimentaria. Las formas graves de presentación (shock cardiogécnico, edema agudo de pulmón, anasarca) representaron el 30%. El 60% de los pacientes se internaron en área crítica. La mediana de permanencia fue de 7 (5-11) días. La mortalidad hospitalaria fue del 8%. A los 90 días, la reinternación fue del 24,5% y la mortalidad posalta fue del 12,8%.

Conclusiones
El presente registro confirma que se trata de una población de edad avanzada con una incidencia alta de comorbilidades. Muchas descompensaciones ocurren por factores prevenibles. La tasa de complicaciones es elevada y no se redujo en la última década.

Palabras clave > Insuficiencia cardiaca - Hospitalización - Mortalidad

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