Evolution of Heart Failure-related Hospital Admissions and Mortality Rates: a 12-Year Analysis

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Abstract

Background: Heart failure (HF) is the final common event of all cardiac diseases. Technological advances have allowed for significant improvement to survival rates in cardiac patients. Correspondingly, an increase in the HF incidence has been observed. Few data are available on technological advances and their actual impact on the mortality rate of these patients.

Objective: To assess the progress of hospital admission rates of adult patients with heart failure, average length of stay and mortality rate in the Brazilian SUS (Unified Health System).

Methods: DATASUS data for the 2001-2012 period were obtained. An assessment was performed of data such as all-cause hospital admissions and heart failure-related admissions, average length of stay in hospital, mortality rate and hospital costs, after being stratified by sex, age and place of hospitalization.

Results: Over the study period, there have been 91,272,037 hospital admissions, of which 3.96% were due to HF. Male patients accounted for 50.76%. The absolute number of HF-related hospital admissions decreased from 379,463, in 2001, to 240,280, in 2012. The average overall stay in hospital was 5.8 days, in 2001, and 6.6 days, in 2012. The mortality rate was on the rise, from 6.58%, in 2001, to 9.5%, in 2012 (a 46.1% increase). The average cost of AH increased from R$ 519.54, in 2001, to R$ 1,209.56, in 2012 (a 132.8% increase).

Conclusion: Despite the decline in hospital admissions, HF is a highly costly syndrome for the Brazilian Unified Health System, with high mortality rates, which paradoxically increased over time, despite technological advances.

Keywords: Heart failure; Mortality; Epidemiology; Adult

Introduction

Heart failure (HF) is the final common event of all cardiac diseases. The increase in life expectancy, the improvement in the treatment of hypertensive patients, the best care offered to acute coronary patients and the longer survival of patients undergoing chemotherapy tend to increase HF incidence⁻⁴.

The medical progress in identifying pathophysiology, the research of new system-specific blocking drugs and the use of pacemakers and resynchronizers for treatment and prevention of ventricular dysfunction progression resulted in a progressive increase in the survival and quality of life of patients with ventricular dysfunction⁻³⁻¹⁰.

Heart failure is a syndrome whose prognosis is closely related to functional capacity, degree of systolic dysfunction and number of hospital admissions. Fact has it that the re-hospitalization rate of patients due to heart failure is above 50.0% within six months⁻¹¹⁻¹⁴.
The purpose of this study is to assess the evolution of hospitalization rates of adult patients (aged above 18) with heart failure, their average length of stay and mortality rate in the Brazilian SUS (Unified Health System).

**Methods**

Data were obtained on DATASUS\textsuperscript{15}, the public epidemiological database of the Brazilian Unified Health System. HF-related hospital admissions occurred over the 2001-2012 period were assessed and variables were studied, such as gender, number of hospital admissions, geographic region, age, average length of stay, mortality rate and hospital cost.

As this study involves DATASUS site data made available to the public (<http://www2.datasus.gov.br/DATASUS/index.php?area=0203>), no authorization was needed from the Research Ethics Committee.

**Results**

There were 91,272,037 hospital admissions over the 2001-2012 period. Of these, 3,614,872 (3.96\%) corresponded to heart failure, and 1,836,603 (50.8\%) were male patients. Assessed by age group, the patients in the eighth decade of life (aged 70-79) were those with more hospital admissions, totaling 982,962. Regarding gender, the incidence of heart failure-related hospital admissions was higher in women in the eighth and ninth decades of life, and slightly higher in the third decade of life, whereas in other age groups a higher prevalence of males was observed.

The region with the highest number of hospital admissions was the Southeast, with a total of 1,496,525, accounting for 41.4\% of hospital admissions (Figure 1).

The average overall stay in hospital due to heart failure increased from 5.8 days, in 2001, to 6.6 days, in 2012 (Figure 2). The gender-related differences in the average hospital stay were not significant when adjusted for age, maintaining the same standard number of admissions, i.e., greater for men, until the sixth decade, and then for women (6.6 days for men vs. 6.5 days for women).
The all-cause hospital admissions to heart failure-related hospital admissions ratio was reduced from 4.64%, in 2001, to 2.87%, in 2012 (a 38.0% decrease).

The heart failure-related mortality rate analysis revealed that the in-hospital death rate increased from 6.58%, in 2001, to 9.5%, in 2012 - an increase of 46.1% (Figure 3).

Regarding hospitalization costs, the average cost of AH increased from R$ 519.54, in 2001, to R$ 1,209.56, in 2012 (an increase of 132.8%).

**Discussion**

This study assessed the evolution of heart failure-related hospital admissions in the Brazilian Unified Health System, over a 12-year period and compared it in terms of age and gender.

Over the past 12 years, treatment of heart failure has evolved in parallel with new scientific evidence, allowing for a reduction in morbidity and mortality in randomized clinical trials. The use of beta-blockers, the blocking of the renin-angiotensin-aldosterone system with two drugs, the possibility to use angiotensin receptor blockers in patients who are intolerant to angiotensin converting enzyme inhibitors, and the use of resynchronizers and implantable cardioverter in selected cases caused the quality of life and survival of these patients to improve\(^{1,5,10,16}\).

Despite the data that associate underprivileged socioeconomic levels with higher incidence of hospital admissions due to heart failure, this study has revealed the opposite. The richest regions of the country had the highest number of hospital admissions. This fact can be explained by the higher number of hospitals in these regions and the greater availability of specialized centers, which may result to healthcare related migration\(^7\).

The higher prevalence in males has shown to be constant not only in records but also in randomized clinical trials. The most curious data was the reversal in the prevalence after the seventh decade of life. The discrepancy between the highest prevalence in hospitalized male patients until the sixth decade and a consequent higher prevalence of female patients in subsequent decades can be explained by the longer life expectancy of women compared to that of men. This study presents data similar to those found in the EHFS II (European Heart Failure Survey)\(^{18}\), as well as from an English population study\(^{6,8,13,17,18}\).
Female patients with heart failure are typically older, have a higher ejection fraction and lower associated coronary disease, as compared to male patients\textsuperscript{1,19}.

The downward trend in hospital admissions has already been mentioned in other population analyses. Despite the decline in heart failure-related hospital admissions in absolute numbers, and the decline in heart failure-related hospital admissions-to-all-cause admissions ratio, the length of stay and mortality rates increased over time. This result can be paradoxically explained by improved clinical management of patients, with decreased need for hospitalization. A fact that cannot be ignored is that 1/3 of patients with heart failure die from sudden death, probably due to ventricular arrhythmias, and these deaths typically occur outside hospitals\textsuperscript{1,18-22}.

The decrease in hospital admissions can also be explained by the greater access of the population to medications and also by patient guidance regarding medication adherence. Adherence to treatment is known to have an impact on clinical prognosis of patients with heart failure, as well as the number of medications, doses and side effects. The simple need for more than two doses of medications increases 2.59 times the risk of non-adherence to treatment\textsuperscript{23-26}.

The rise in in-hospital mortality rate can also be explained by new drugs such as beta blockers and spironolactone, which, based on randomized clinical trials, have shown a reduction in sudden death, thus leading to increased patient survival. However, the evolution of the disease results in these patients having pump failure, decompensated heart failure and in-hospital death\textsuperscript{5-10}.

The ADHERE\textsuperscript{26} survey showed an in-hospital mortality rate of 4.2%. However, when risk is stratified using classification tree analysis, the mortality rate ranged from 2.14% to 21.9%, depending on the systolic blood pressure, urea and creatinine level at the moment of admission, demonstrating the heterogeneity of patients hospitalized due to heart failure\textsuperscript{26}.

Recently published, the BREATHE\textsuperscript{27} survey showed extremely valuable data regarding the epidemiological aspects of patients hospitalized due to acute HF, showing high proportion of elderly patients (mean age 64.1 ± 15.9 years old, with 73.0% of patients >75 years old) associated with an in-hospital mortality of 12.6%. This fact can be explained by a major factor, mainly because the BREATHE survey patients are older, as the percentage of the population in our study aged above 70 and was only 27.2\%\textsuperscript{27}.

An alarming fact was the increase in the hospital cost for patients with heart failure, which jumped from R$ 519.54, in 2001, to R$ 1,164.95, in 2011, an increase by 124.2%, although no reduction in hospital mortality rate has been observed. This could be explained by the increase in the average length of stay, as well as by procedures such as cardiac surgery, stent implantation and cardiac resynchronizers.

As these AH data were collected from DATASUS, this study has some limitations with regard to the assessment of prognostic aspects of patients with heart failure, such as: use of medications prior to hospital admission, cause of heart failure and functional class according to New York Heart Association. Another issue is the lack of uniformity of the heart failure diagnosis, which may result in failure to include some patients.

Despite the technological advances and decrease in hospitalization rates, length of stay and mortality rates have increased, probably due to the clinical complexity of patients; as a result, an increase in the average hospital cost has been observed.

**Conclusion**

We can conclude that despite all technological advances that enabled the increase in life expectancy of patients with ventricular dysfunction, heart failure remains as a syndrome responsible for a major socioeconomic impact and high hospital mortality.

**Potential Conflicts of Interest**
No relevant conflicts of interest.

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This study had no external funding sources.

**Academic Association**
This study is not associated to any graduate programs.
References


