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EDITORIAL COMMENT

Heart failure: The value of evidence-supported decision-making

Insuficiência cardíaca: o valor da tomada de decisão apoiada pela evidência

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Heart failure (HF) was identified as an emerging epidemic more than two decades ago,[1] and is currently estimated to affect at least 26 million people worldwide.[2] HF is a complex syndrome that is difficult to define, characterized by the heart's inability to meet the body's metabolic demands resulting from structural and/or functional impairment of ventricular filling or ejection.[3,4] Diagnosis is largely clinical, based on symptoms and signs, for which imaging techniques (particularly echocardiography) and measurement of neurohormonal peptides are crucial. Although in most cases the focus is on symptomatic HF, a proportion of high-risk patients may have no symptoms despite reduced left ventricular ejection fraction, and they may also benefit from medical therapies that favorably impact prognosis.

Worldwide, the overall prevalence of HF is about 1-2%, but this figure increases considerably with advancing age. Progress in primary prevention and improvements in medical care have resulted in improved survival, which in turn is expected to lead to a steady rise in the prevalence of HF. In the US, an estimated 6.2 million individuals aged ≥20 years have HF (data from the US National Health and Nutrition Examination Survey, 2013 to 2016),[5] which represents an increase of 8.77% in comparison to the previous four years, and projections show that the prevalence of HF will increase by 46% from 2012 to 2030, resulting in >8 million people aged ≥18 years with the condition.[5]

In a recent paper, Conrad et al. provided contemporary insight into the magnitude of the HF burden in a representative sample (four million individuals) of the general population of the UK, between 2002 and 2014.[6] They showed that incidence (standardized by age and gender) decreased by 7% over this period, which appeared to be mainly driven by a lower incidence of HF in people between 60 and 84 years of age. However, the incidence in people aged 85 and older increased substantially over the observation period. Moreover, the authors found that the absolute prevalence had increased by 23%, and attributed this increase to population growth and aging, in addition to more people surviving a myocardial infarction.[6]

Temporal trends in incidence are variable across studies and difficult to rely on due to methodological differences regarding populations, settings, and ascertainment and adjustment approaches, but overall indicate that the incidence of HF is stable or even decreasing over time.[7] However, the lifetime risk for HF in the community is very high (ranging from 30% to 40%),[8–10] with traditional factors accounting for a considerable proportion of HF risk and con-

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tributing to the rise in HF prevalence.[5] Despite the progress in therapies (drugs and devices) observed during recent decades, HF remains a morbid, fatal and costly condition, with a global burden that will increase dramatically with an aging population. In fact HF is the single leading cause of hospitalization in persons aged 65 years and above.[6] Rates of hospitalizations for HF are increasing over time, apparently driven by rises in HF with preserved ejection fraction (HFpEF).[5] Diastolic dysfunction is a common condition, especially in the elderly,[5,11] and HFpEF may soon be dominant, if it is not already, in driving overall HF prevalence.[10]

HF constitutes an enormous economic burden for health care systems in industrialized countries. Europe and the US spend 1-2% of their annual health care budget on HF. Cook et al.[12] estimated the overall cost of heart failure in 2012, in both direct and indirect terms, across the globe. They included 197 countries in the analysis, covering 98.7% of the world's population. The overall economic cost of HF in 2012 was estimated at $108 billion per annum. Direct costs accounted for ~60% ($65 billion) and indirect costs accounted for ~40% ($43 billion) of the overall spend. The US is the biggest contributor to global HF costs, accounting for 28.4% of the total ($30.7 billion).[5,12] Europe accounts for 6.83% of total global HF costs.[12] High-income countries spend a greater proportion on direct costs, while in middle- and low-income countries a higher proportion is spent on indirect costs.[12] US projections suggest that by 2030, the total cost of HF will increase by 127%, to $69.8 billion, amounting to ≈$244 for every American adult.[5]

In this issue of the *Journal*, Gouveia et al.[13] present a cost-of-illness (COI) study on HF in mainland Portugal, following a prevalence-based approach and the societal perspective to estimate direct and indirect costs related to HF.

On the basis of the estimated prevalence and costs for 2014 (the index year), the authors estimated changes for the following two decades (up to 2036), considering only the predicted aging of the population. Only the resident population ≥25 years of age with symptomatic HF (New York Heart Association [NYHA] functional class II-IV) was included. The prevalence of HF in 2014 was estimated on the basis of the EPICA study (1998-2000),[14] adjusted for the expected changes in demographics since that study.

The different settings experienced by HF patients were analyzed. Direct costs included hospitalizations, hospital outpatient services, emergency department (ED) visits (with and without hospitalization), day hospital care, medications, transportation, and use of the national network of long-term care (nursing home hospitalization or equivalent). Data from 2014 on hospitalizations and hospital outpatient services were estimated based mostly on data from the national Diagnostic-Related Group database and identified according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9). For the purposes of the study, hospitalization was attributed to HF when this was listed as a primary diagnosis, when it was coded as secondary to a primary diagnosis of circulatory system disease, or when there were invasive cardiac procedures (surgery or device implantation) irrespective of other associated diagnoses. All procedures and interventions related to HF were included in the costs of HF during the hospitalization episode. Estimates of other relevant costs regarding hospital outpatient services were also derived from diverse sources of information, including the opinion of a panel of HF experts representing various different geographical areas. Estimation of costs related to primary care use was preceded by a cross-sectional study analyzing data from the information system of the Lisbon and Tagus Valley Regional Health Administration. From a population of 1.8 million, 25 316 individuals were identified aged ≥25 years, with at least one medical visit during the index year (2014), and a code of HF (K7 in the International Classification of Primary Care, second edition). Costs (including those related to medical therapy) were obtained from the Lisbon and Tagus Valley Regional Health Administration database.

The indirect costs that were considered corresponded to lost productivity due to lower employment rates or absenteeism.[13] The authors assumed that only patients under 65 years generate indirect costs, and that patients in NYHA functional class II generate only indirect costs for absenteeism.

For the estimation of future costs, the authors considered that all variables and parameters that generate costs would remain constant, except for the demographic composition of the population, i.e. they considered that the mean cost per patient and the prevalence rates of HF by gender and age would not vary over the period considered.

The estimated overall prevalence of HF for 2014 was 5.2% (mainland Portugal, population aged 25 years of age or over). The prevalence of HF generating costs (NYHA functional classes II-IV) was 3.4%. The overall economic cost of HF in 2014 was estimated at €405 million, representing around 0.2% of gross domestic product and 2.6% of total public health expenditure. Direct costs accounted for 74% (€299 million), of which 39% was attributed to hospitalizations, 24% to medications, 17% to exams and tests and 16% to consultations. Indirect costs accounted for 26% (€106 million) of the overall spend, 84% of which was for reduced employment and 16% for absenteeism.

According to the authors' estimated projections for 2036 in mainland Portugal, the number of patients with HF (NYHA functional class II-IV) will increase by 27% relative to 2014, corresponding to an overall cost of €503 million in 2036 (an increase of 24%). The increase in the number of older people with HF, along with a constant rise in direct costs, explains the increase in total cost; a decrease in indirect costs is expected and attributed to demographic changes, as there will be fewer people younger than 65 years of age (lower prevalence of HF and decreased indirect costs). The decrease in indirect costs also explains the discrepancy between the rate of increase in total costs (27%) and the rate of increase in the number of patients with HF (24%). The annual cost per patient with HF (NYHA class II-IV) is predicted decrease from ~€1623 in 2014 to ~€1582 in 2036, but the cost per head of population will increase by ~34% between 2014 and 2036, amounting to ≈€55 for every adult.

The overall picture in mainland Portugal is in line with the international literature on this subject. In a recent systematic review (2004-2016)[15] of 16 published COI studies dealing with the cost impact of HF, considerable variation was observed in cost components and estimates, as the methodologies used varied widely and health care systems are very different across countries. Only three studies esti-

mated indirect costs, and four European studies published between 2013 and 2017[16–19] focused mainly on costs related to HF hospitalizations, while none estimated costs for lost productivity. However, most of the 16 included studies[15] showed that hospitalizations are the most expensive element.

Also, according to Gouveia et al.'s estimates,[13] hospitalizations accounted for 39% of direct costs while only 16% were attributed to consultations, a situation that urgently needs to be changed. Medications accounted for 24% of direct costs, which is to be expected considering the heavy pharmacological burden of HF patients. The benefit provided by prognosis-modifying therapies may outweigh the economic burden of hospitalizations, although given the greater longevity achieved along with the corresponding increase in HF prevalence, it is difficult to expect a reduction in the total cost of the illness.

The work by Gouveia et al.[13] has several merits besides being the first study to shed light on the costs of HF in Portugal and the corresponding estimated projection for the next two decades. First, the study covers the population with HF in the different possible contexts of management: the hospital setting (hospitalization, consultations, day hospital care, emergency department visits without hospitalization); the community (outpatient setting), i.e. management in primary health care; and care at home (or in an institution) integrated in the National Network of Long-Term Care. Second, the work reflects the situation in Portugal using a methodology that appears flawless, erring only on the side of underestimation. In other words, the cost estimates are conservative, as stated by the authors, not including variables for which information is scarce or nonexistent. These include the following additional costs: those arising from the large number of patients who are likely to be followed simultaneously in two places (e.g. hospital consultations and primary care); the proportion of patients with reduced ejection fraction but without symptoms (NYHA functional class I) who may be under pharmacological therapy and hence generate costs; cardiac rehabilitation programs (for which there are no published estimated costs); and indirect costs associated with patients aged 65 years and over, as the authors took the conservative option of considering that only patients under 65 are productive.

However, this conservative methodological approach not only shows the criteria used in estimating calculations in a positive light, it also tells us how much HF is actually costing this country. Life expectancy at birth in Portugal rose by over four years between 2000 and 2015, to 81.3 years, and most of the gains in life expectancy since 2000 have been after the age of 65.[20] Along with the continuing need to prevent HF by controlling cardiovascular risk factors throughout life, efforts should be made to improve early diagnosis of HF and also to reduce the need for hospitalization, which is largely responsible for the cost of the condition. Innovative strategies like remote invasive monitoring have been shown to reduce the risk of recurrent HF hospitalization[21] and have a favorable cost-effectiveness profile.[22,23] Additionally, the TIM-HF 2 study on non-invasive monitoring suggested that a structured remote patient management intervention, when used in a well-defined HF population, could reduce the percentage of days lost due to unplanned cardiovascular hospital admissions and all-cause mortality.[24] According to the European Society of Cardiology's 2019 clinical practice update on heart failure, a similar approach to that used in TIM-HF 2 may be considered to reduce the risk of recurrent cardiovascular and HF hospitalizations and the risk of cardiovascular death.[25] These and other strategies may be tested, but their cost/benefit ratio needs to be appropriately assessed.

COI studies are an essential tool for providing health professionals and health policy makers with information on cost drivers, facilitating targeted decision-making regarding allocation of costs and resources.[15] The study by Gouveia et al.[13] provides key information in this regard and can be used as the basis for other economic assessments.

Conflicts of interest

The author has no conflicts of interest to declare.

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