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## Original research article

# Chronic heart failure – Impact of the condition on patients and the healthcare system in the Czech Republic: A retrospective cost-of-illness analysis

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## ABSTRACT

**Background:** The number of patients with heart failure is steadily increasing, as are the costs of their treatment. Nearly 70% of the costs associated with the treatment of heart failure are direct medical costs, and 70–80% of these are spent on hospitalizations. The aim of our study is to describe the all-cause hospitalization costs of patients with chronic heart failure (chronic HF) from the perspective of the healthcare system in the Czech Republic.

**Methods:** In total, 1274 consecutively collected patients discharged in a stable condition from hospitalization for acute heart failure (= index hospitalization) from 2006 to 2012 were followed-up for 2 years. Their all-cause mortality and all-cause hospitalizations were retrospectively evaluated. The in-patient costs were calculated based on the relative weights of DRG codes for particular hospitalization events and on the basic DRG tariff for 2013 (CZK 28,898).

**Results:** At the end of the 2-year follow-up, a total of 1511 hospitalizations were recorded. A total of 31.8% of patients survived without any hospitalization, 32.1% of patients survived with at least one hospitalization, and 36.1% of patients died. Re-hospitalizations for acute heart failure accounted for 31.2% of all cases. The average cost for one chronic HF patient hospitalized for any reason was CZK 85,414; the cost for acute heart failure re-hospitalization was CZK 31,320 during the 2-year follow-up period. The cost of all-cause hospitalizations within the first year after the index hospitalization was higher compared to the cost during the second year (CZK 58,528/year vs. CZK 23,082/year). As the estimated number of chronic

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HF patients is 230,000 (data from the Institute of Health Information and Statistics of the Czech Republic), we can calculate the total cost of all-cause hospitalizations of chronic HF patients to be approximately CZK 7.98 billion per year in the Czech Republic.

**Conclusion:** The data from clinical practice confirm that patients with chronic HF discharged from acute heart failure hospitalization are at high risk of death and/or subsequent hospitalization. The average annual costs for all-cause hospitalizations of CHS patients within the first and second years are CZK 58,528 and CZK 23,082 per patient, respectively. The costs attributed to all-cause hospitalization care of chronic HF patients can be estimated as approximately 7.7% of all annual inpatient expenses of health insurance companies and 2.7% of total healthcare expenditures in the Czech Republic.

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## Introduction

The prevalence of chronic heart failure (chronic HF) is increasing, mainly due to advances in the management of emergency situations being accompanied by heart failure symptoms and due to aging of the population. At present, the prevalence of this disease is generally considered to be 1.0–2.0% in the adult population [1], with some sources indicating up to 4% in the general adult population and more than 10% in the population over 70 years of age [1,2]. The number of patients is expected to increase, for example, by 46% in the USA in 2030 when compared to the year 2012 [3].

Advances in the treatment of heart failure have led to a documented decline in mortality. The significant evidence-based approaches include the implementation of pharmacotherapy with ACE inhibitors and beta-blockers, percutaneous coronary revascularization, surgical treatment of valve defects and revascularization, implantable defibrillators and resynchronization therapy [4]. Despite these undisputed advances in the treatment of heart failure patients, their prognosis still remains unfavourable, and 40% of them die within 2.5 years of the diagnosis [5]; thus, the prognosis is comparable to those with a tumour-related disease [6]. Repeated hospitalizations of chronic HF patients are one of the most pronounced predictors of increased mortality, and these hospitalizations account for significant healthcare expenditures [7]. There are approximately 1 million heart failure hospitalizations in Europe per year, representing 1–2% of all hospitalizations [8]. According to the 2015 World Health Organization statistics, cardiovascular diseases are responsible for 31.3% of all deaths, twice the number of deaths from malignant tumours. Expressed by a composite indicator including premature death and reduced quality of life (DALY, Disability Life Years), cardiovascular diseases contribute the most to the loss of population health in the Czech Republic (World Health Organization statistics) [9]. According to the European Organization for Economic Co-operation and Development (OECD), the mortality rate for cardiovascular diseases in the Czech Republic is more than double (260.4 per 100,000 inhabitants) compared to the average in the OECD countries (115.2 per 100,000 inhabitants) [10].

In general, cost analyses can describe different types of costs, most commonly the medical (direct) costs associated with pharmacotherapy, hospitalizations, outpatient treatment and transportation. Indirect costs comprise the loss of patient

productivity due to premature death or morbidity and the loss of productivity of their caregivers. Furthermore, one can calculate overall costs from different perspectives. The most complex view of the cost of the illness is a societal perspective when all types of costs are included. However, a narrower perspective focusing predominantly on the direct costs paid by national health insurance companies – the healthcare system's (insurance companies') perspective – is commonly used to calculate expenditure [11].

It has been reported that in the USA, in 2012, the total chronic HF treatment costs reached approximately USD 30.7 billion and reached as much as USD 108 billion worldwide [12]. Almost 70% of the costs spent on the treatment of heart failure patients are direct medical costs, of which 70–80% are consumed for hospitalizations in European countries [13]. With regard to the higher occurrence of the disease in older age groups, it is not surprising that up to 80% of these costs apply to patients over the age of 65 years [14]. Heart failure treatment costs make up 1.9–2.1% of the total healthcare expenditures in selected European countries (Germany, Sweden, the Netherlands) and about 1.1% in the USA [12]. It is evident that chronic HF has a significant socio-economic impact on population health and on the economy. This impact must be especially considered when the population is gradually aging [4].

The prognosis of patients hospitalized for heart failure is poor [15,16]. Long-term mortality rates are generally known [17], but data about the frequencies and causes of subsequent hospitalizations of these patients are rare. Such data from real clinical practice describing morbidity, mortality and costs provide valuable information about the actual socio-economic burden of the disease and serve as essential source data for the Health Technology Assessment (HTA) process. Thanks to the HTA, one can objectively assess and prioritize healthcare provisions and resource allocation (reimbursement of new interventions such as novel drugs, preventative programs, surgical procedures, etc.).

Our study is performed on a set of consecutive acute heart failure patients discharged from a hospital in a stable condition. These patients are considered as chronic HF patients.

The aim of the present study is to describe the estimated costs of all-cause hospitalization care for patients with chronic HF in the Czech Republic from the healthcare system

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