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Original research article

Cost analysis of telemedicine monitoring of patients with implantable cardioverter-defibrillators in the Czech Republic

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ABSTRACT

Introduction: Telemonitoring of patients with implantable cardioverter-defibrillators (ICD) is, in general, considered safer, more efficious, and increasingly cost-effective. The aim of our work was to assess the long-term economic benefit associated with telemetric monitoring of patients with newly implanted ICD using the Home Monitoring™ (HM) system compared to standard outpatient care in the Czech Republic.

Methods: Patients were randomized to telemetric monitoring using the HM system with daily automated data transfer and outpatient follow-up at 12-month intervals (HM+) or standard outpatient follow-up (HM−). Average total costs per patient and months of follow-up were estimated based on invoices from health insurance companies, direct costs to patients, and the operating costs of the HM system.

Results: In total, 198 patients were followed for 37.4 ± 15.2 months. The number of planned outpatient visits was reduced by 48% during the follow-up period in the HM+ group ($p < 0.001$). Significantly shorter hospital stays were also observed in the HM+ group. Data concerning costs were obtained in 75% of patients. Higher costs for outpatient care (223 ± 99 CZK vs. 189 ± 93 CZK, $p = 0.039$) and medical transport services (640 ± 314 CZK vs. 367 ± 187 CZK, $p = 0.003$) were found in the HM− group. When taking into account the operating costs of the HM system in addition to the costs for outpatient care and transport, the difference between groups was not significant; however, when the reimbursement of telemetric monitoring and costs for the patient unit were also reflected in the calculations, the average cost in the HM+ group was higher (541 ± 188 CZK vs. 401 ± 332 CZK, $p = 0.002$). Cost-neutrality could be obtained if all patients were transported free of charge to their outpatient visits.

Conclusion: In the Czech Republic, the HM system has been cost-effective for health insurance companies in patients with single- or dual-chamber ICDs. When calculating using the

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reimbursement from payers of the healthcare, the HM system would remain cost-neutral only if most patients had reimbursed transportation costs. The clinical effect of telemetric monitoring is directly related to the continuity of follow-up and the possibility to detect events very early and to intervene accordingly; we thus believe that the HM system should be automatically paid for in all patients with an implantable ICD. The related increase in costs would be insignificant in the context of the entire healthcare budget.

Introduction

The average life expectancy is steadily increasing in developed countries. However, the entire population is getting older as a result and we can expect realistically that this trend will continue for decades. The prevalence of chronic illnesses rises in aging populations, accompanied by the need for adequate and high-standards of healthcare. Given the results of randomized multicentric trials published over the last decade, indications for implantable cardioverter-defibrillator (ICD) use has widened significantly, especially in patients with chronic heart failure [1–3]. Population of patients requiring lifelong specialized care is thus increasing (Fig. 1), and substantial personal and financial resources within the healthcare system have to be allocated to address this issue.

Regular ICD check-ups are necessary for many reasons. Besides the technical check-up and download of clinical records from the device, pharmacotherapy may need to be adjusted, and the technical parameters of the device may need to be changed. Planned follow-up visits are discontinuous, however, and do not allow for early acquisition of clinically relevant data; moreover, this care can only be provided in specialized centers by a relatively small group of trained experts. The above factors became the motivation for finding an alternative way to follow such patients, which would be safe, effective, have reasonable costs, and reduce the number of outpatient follow-up visits to the necessary minimum. The last decade – especially in cardiology – has thus seen the development of telemetric monitoring, creating maximum "continuity" (that cannot be provided or even approached during standard follow-up visits) of healthcare possible.

The aim of our study was to assess the long-term benefit associated with telemetric monitoring in a group of patients with a newly implanted ICD and using the Home Monitoring™ system (BIOTRONIK SE & Co. KG, Berlin, Germany) and compare them with those receiving standard outpatient follow-up. Our primary goal was to assess the cost-effectiveness of telemetric monitoring during long-term follow-up of patients with newly implanted ICD in the Czech Republic (CR) in real clinical practice. Our secondary goals were to evaluate the clinical effect and safety of telemetric monitoring with respect to the number of regular (planned) vs. on-demand (extra) follow-up visits and the usefulness of these visits, number and length of necessary hospitalizations related to the baseline cardiac disease, number of discharge therapies delivered by the device and their adequacy, and total mortality. These clinical data were published elsewhere [4]; as such, this article deals with the cost-effectiveness of telemetric monitoring only.

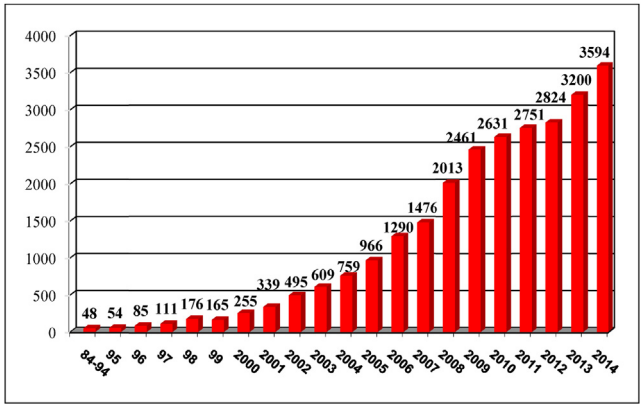

Fig. 1 – Number of ICDs (both first implantations and elective replacements) implanted in the Czech Republic between 1984 and 2014.
***Source*: Registry of ICD in the Czech Republic.**

Methods

Methods used in this work were described in detail elsewhere [5]. Briefly, our cohort consisted of patients indicated for implantation of a single- or dual-chamber ICD for primary or secondary prevention of sudden cardiac death (SCD), according to the current guidelines of the Czech Cardiologic Society [6]. Prior to ICD implantation, patients in every center were consecutively randomized (1:1) into two groups, between 2008 and 2009. Patients were excluded from the trial when indicated for cardiac resynchronization therapy, expected to be non-compliant, failed to sign the informed consent, suffered from severe comorbidities lowering their expected life expectancy to less than 1 year after implantation and/or living at a place where no mobile phone signal was available. The study protocol and the patient informed consent form were approved by the appropriate local ethical committee.

Cost evaluation

Direct costs to health insurance companies were calculated based on real invoices documenting provided and itemized healthcare. In order to obtain the necessary data, we contacted all health insurance companies whose clients were enrolled.