

# The costs of heart failure in Poland from the public payer's perspective.

Polish programme assessing diagnostic procedures, treatment and costs in patients with heart failure in randomly selected outpatient clinics and hospitals at different levels of care: POLKARD

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## Abstract

**Background:** Heart failure (HF) is a chronic disease of great clinical and economic significance for both the healthcare system and patients themselves.

**Aim:** To determine the consumption of medical resources for treatment and care of HF patients and to estimate the related costs.

**Methods:** The study involved 400 primary care practices and 396 specialist outpatient clinics, as well as 259 hospitals at all reference levels. The sample was representative and supplemented with patient interview data. Based on the consumption of particular resources and the unit costs of services in 2011, costs of care for HF patients in Poland were estimated. Separate analyses were conducted depending on the stage of the disease (according to NYHA classification I–IV). The public payer's perspective and a one year time horizon were adopted.

**Results:** Direct annual costs of an HF patient's treatment in Poland may range between PLN 3,373.23 and 7,739.49 (2011), the main cost item being hospitalisation. The total costs for the healthcare system could be as high as PLN 1,703 million, which is 3.16% of the National Health Fund's budget (Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN).

**Conclusions:** The costs of treating heart failure in Poland are high; proper allocation of resources to diagnostic procedures and treatment may contribute to rationalisation of the relevant expenditure.

**Key words:** heart failure, costs, POLKARD, health economics

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## INTRODUCTION

Heart failure (HF) is a chronic disease of great clinical significance, and poses a major economic problem for both the healthcare system and patients themselves. The HF prevalence in developed countries is estimated at 1% to 3% and grows with age [1, 2]. It has been estimated that 15 million patients

in Europe and 5.8 million in the United States have heart failure [3, 4]. In the UK and Scandinavia, the HF prevalence is 0.3–2% in the general population, 2–5% in people aged 70–79, and 10% in people over 80 years of age [5]. In the US, 550,000 new cases and more than 950,000 related hospitalisations are reported annually [6]. Due to the advanced age of

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patients, several concomitant diseases, including those leading to HF, as well as the chronic nature of this disease combined with poor prognosis and frequent hospitalisations, the costs of HF diagnostic procedures and treatment are high. Both five year survival rate and consumption of healthcare resources through hospitalisation are less favourable than in a number of common forms of cancer [7].

In terms of direct medical costs alone, \$20 billion was spent on HF treatment in the US in 2000 [8] and \$39 billion in 2010 [4], \$2 billion in France in 1990 [5, 9] and \$380 million in Sweden in 1996 [10]. In Sweden, HF was responsible for 14% of all hospital days, and hospitalisation accounted for over 50% of the direct costs of this disease [10]. Spending on care for patients with HF has seen an upward trend, which can be attributed mainly to ageing societies in developed countries. Heart failure, either acute (37% of admissions) or chronic (63% of admissions), is the commonest cause of frequently recurring hospitalisation, especially in patients over 65 years of age, in a number of European countries. It has been estimated that between 1% and 2% of healthcare budgets in various countries is spent on HF diagnostic procedures and treatment [11]. In the UK, it was 1.91% of total National Health Service expenditure, while direct medical costs borne by the payer (excluding out-of-pocket expenses of patients) totalled £905 million, the main item (69%) being the costs of hospitalisation [12]. According to another set of data, a total of 5,336,000 prescriptions associated with HF were issued in the UK in 2000, which involved a total cost of approximately £54 million. In the same period, 86,101 hospital admissions, generating costs of £379 million, and 7,644,000 consultations, totalling £104 million, were reported [13–15]. Numerous other sources confirm these figures, which demonstrate the great economic burden of medical care for patients with HF.

This study was aimed at determining the consumption of medical resources for the treatment and care of HF patients and estimating the related costs.

## METHODS

The study involved both randomly selected outpatient units (400 primary care practices and 396 specialist outpatient clinics), accounting for the annual cost of treatment, and inpatient facilities (259 hospitals at all reference levels), accounting for the estimated cost of a single hospitalisation of a patient with HF. The sample was representative and supplemented with patient interview data. A detailed description of the research methods and materials is given elsewhere [16, 17]. Based on the consumption of particular resources determined in the POLKARD study and the unit costs of services in 2011, costs of care for HF patients in Poland were estimated. For outpatient care, the costs of diagnostic procedures as well as medical appointments and consultations were included. Separate analyses were conducted depending on the stage of

the disease (according to NYHA classes I–IV) and depending on the attending physician (general practitioner/specialist).

The perspective of the public payer, i.e. the National Health Fund (NHF), was adopted, and the direct medical costs of treatment of patients with HF were considered. A time horizon was restricted to one year so no discounting was applied. The unit cost estimates of cost-generating diagnostic procedures requested by physicians in outpatient settings were derived from the Regulation of the President of the NHF (Regulation 62/2009/DSOZ of the President of the National Health Fund of 2 November 2009 on the conditions of concluding and performing contracts for outpatient specialist care. <http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=12&artnr=3901>, 15.11.2010). As a per capita scheme is used in settlements with general practitioners (primary care units), and it is not possible to allocate the per capita fee to different diseases in a group of patients attended by the given physician, the unit cost of such appointments was assumed to correspond to the lowest cardiology consultation fee (assigned also to specialist appointments).

The cost per point for cardiology services (within an outpatient specialist setting) was determined as the mean cost per point for such services for all centres in Poland (based on the National Health Fund — Public Information Bulletin — 2010 Contract Guide. <http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=19&artnr=1483>, 5.11.2010), weighted by the number of contracts with the centre. Calculations for all cost groups were based on the aforementioned unit costs as well as data on resource consumption within outpatient care collected through physician and patient questionnaires.

For inpatient care, the division into reference levels was accounted for, in that all facilities were divided into academic centres as well as regional, district and city hospitals. The calculations were based on the service score in points (according to the Regulation 51/2010/DSOZ of the President of the National Health Fund of 1 September 2010 on amending the regulation on the conditions of concluding and performing contracts for hospital treatment; <http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=12&artnr=4200>, 15.11.2010), the value of the NHF's contracts with healthcare centres in Poland in 2010 (the 2010 Contract Guide), and the number of particular medical procedures established in the POLKARD study. If a particular procedure could be assigned to scheduled hospitalisation, the relevant score in points was preferred over service score within emergency hospitalisation or 'one-day treatment' setting. For hospitalisations other than for HF [for which no data on administered procedures had been collected, so it was not possible to determine diagnosis related groups (DRG) for such hospitalisations], the cost corresponding to the mean cost of hospitalisation according to the 2009 Annual Report of the National Health Fund was assigned (<http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=11&artnr=4137>, 10.01.2011). In a similar way, the cost

of hospitalisation of patients in anaesthesiology and intensive care units (AICU) was assessed. The cost of one point (from the 2010 Contract Guide) was multiplied by the mean score of one man-day of hospitalisation in AICU (the mean score across all TISS groups according to the catalogue of services to be summed up in line with the Regulation 51/2010/DSOZ of the President of the National Health Fund of 1 September 2010 on amending the regulation on the conditions of concluding and performing contracts for hospital treatment; [http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=12&artnr=4200, 15.11.2010](http://www.nfz.gov.pl/new/index.php?katnr=3&dzialnr=12&artnr=4200,15.11.2010)), and the total number of hospital days for the relevant populations.

The cost of a single hospitalisation would cover the cost of treatment in AICU and/or the cost of treatment in other wards (outside AICU). The cost of treatment in non-AICU wards depended on medical procedures conducted during hospitalisation, which determined the DRG for settlements for the given patient. The costs of hospitalisation were determined by taking a maximalist approach, i.e. assuming that each of the procedures listed below required a separate hospitalisation; if the mean number of hospitalisations exceeded the mean aggregate number of procedures, non-treatment hospitalisation was assigned the mean cost for HF groups (there are two DRGs for HF, namely 'Heart failure > 69 years or complicated' and 'Heart failure < 70 years, uncomplicated'). Additionally, a minimalist approach was tested (sensitivity analysis) by assuming that coronarography and angioplasty were performed as a part of hospitalisation for other reasons (and thus generated no additional costs).

The costs of medicines, diagnostic procedures and treatments received by patients in inpatient facilities are included in hospitalisation costs, which are reflected in scores of particular DRGs (the relevant database also includes information about particular medicines and diagnostic procedures used in hospitals).

Owing to differences related to the choice of a sample and, consequently, the characteristics of groups of respon-

dents, the data concerning patients included in the outpatient arm and the inpatient arm of the study were processed separately, provided that the analysis of the annual costs of treatment of HF, which was based on the outpatient data, used the AICU treatment data collected for patients included in the inpatient arm of the study. The costs of drug treatment were considered as a whole, assuming that the structure of usage and reimbursement expenditure at the moment of collecting data on resources was similar to that at the moment of calculations. The analysis did not account for the costs of medical transport, but information on the number of emergency ambulance dispatches to patients with HF was collected in the study.

## RESULTS

The results related to the enrolment of health care centres into the study and the data collected from them (5,275 questionnaires), the characteristics of an additional group of patients (1,024 questionnaires) as well as the description of diagnosing and managing patients are given elsewhere [16, 17].

The tables below present the annual consumption of resources for the treatment of HF patients by NYHA class. The mean number of hospitalisations and medical appointments depending on the NYHA class is presented in Table 1. Furthermore, the diagnostic procedures requested by specialists and general practitioners are presented in Table 2. Although basic diagnostic procedures do not affect the costs of treatment, as their cost is included in the cost of medical appointments, the data on the mean number of such procedures provides information about the diagnostic regimens followed by primary and specialist care physicians, and thus constitute an added value of the analysis.

The mean number of therapeutic procedures in HF patients per annum is presented in Table 3.

The average number of days spent by patients in anaesthesiology and intensive care units during a single hospitalisation, depending on the patient's NYHA class, is presented in Table 4.

**Table 1.** Annual consumption of resources: hospitalisations and medical appointments

Item	Average number per patient, annually (range)				
	NYHA I (n = 61)	NYHA II (n = 2,004)	NYHA III (n = 1,569)	NYHA IV (n = 173)	Total (n = 3,915)
Hospitalisation for heart failure	0.32 (0–8)	0.45 (0–12)	0.89 (0–10)	1.84 (0–10)	0.68 (0–12)
Hospitalisation for other reasons	0.36 (0–4)	0.3 (0–6)	0.35 (0–18)	0.27 (0–5)	0.33 (0–18)
Outpatient appointments (scheduled)	8.49 (0.5–110)	8.27 (0–110)	9.48 (0–52)	10.951 (0–26)	8.90 (0–110)
Outpatient appointments (emergency)	0.66 (1–8)	0.68 (1–26)	1.55 (1–33)	2.81 (1–30)	1.12 (1–33)
Home visits (scheduled)	0.36 (0–12)	0.31 (0–22)	0.78 (0–48)	1.37 (0–30)	0.55 (0–48)
Home visits (emergency, due to intensification of heart failure symptoms)	0.17 (0–8)	0.16 (0–12)	0.52 (0–12)	1.15 (0–15)	0.35 (0–15)
Home visits (emergency, for other reasons)	0.10 (0–3)	0.14 (0–10)	0.28 (0–15)	0.43 (0–12)	0.21 (0–15)

**Table 2.** Annual consumption of resources: diagnostic procedures requested by general practitioners and specialists

Type of procedure	Average number per patient, annually (range)		
	Specialists (n = 1,970)	GPs (n = 1,993)	Total (n = 3,963)
Complete blood count	1.40 (0–20)	1.86 (0–30)	1.63 (0–30)
ASPAT	0.98 (0–10)	1.22 (0–24)	1.1 (0–24)
Serum bilirubin	0.62 (0–11)	0.76 (0–32)	0.69 (0–32)
Serum glucose	4.42 (0–650)	8.29 (0–865)	6.36 (0–865)
Serum sodium	1.74 (0–30)	1.69 (0–18)	1.72 (0–30)
Serum potassium	1.83 (0–30)	1.85 (0–24)	1.84 (0–30)
Serum creatinine	1.52 (0–53)	1.59 (0–24)	1.56 (0–53)
Serum uric acid	0.51 (0–10)	0.65 (0–24)	0.58 (0–24)
Serum urea	0.98 (0–12)	1.18 (0–24)	1.08 (0–24)
Proteinogram or serum albumin level	0.23 (0–5)	0.30 (0–12)	0.27 (0–12)
Lipid profile	1.25 (0–32)	1.62 (0–18)	1.44 (0–32)
TSH and/or fT4	0.45 (0–12)	0.49 (0–10)	0.47 (0–12)
B-type natriuretic peptide	0.11 (0–6)	0.04 (0–6)	0.07 (0–6)
General urine test	1.16 (0–12)	2.18 (0–24)	1.67 (0–24)
Troponin	0.44 (0–20)	0.36 (0–12)	0.4 (0–20)
CPK and/or CPK-MB	0.40 (0–10)	0.41 (0–13)	0.4 (0–13)
International normalised ratio	0.45 (0–24)	0.54 (0–50)	0.49 (0–50)
Electrocardiogram (ECG)	4.29 (0–40)	3.97 (0–60)	4.12 (0–60)
Chest X-ray	0.86 (0–15)	0.91 (0–11)	0.89 (0–15)
Echocardiography	1.11 (0–16)	0.67 (0–12)	0.89 (0–16)
Spirometry	0.11 (0–4)	0.26 (0–9)	0.19 (0–9)
Holter ECG	0.46 (0–5)	0.25 (0–12)	0.36 (0–12)
Exercise test	0.26 (0–4)	0.23 (0–12)	0.24 (0–12)
Abdominal ultrasonography	0.01 (0–3)	0.02 (0–4)	0.02 (0–4)

ASPAT — asparagine-oxo-acid transaminase; CPK — creatine phosphokinase; GP — general practitioner; TSH — thyroid-stimulating hormone, thyrotropin

The payer's expenditure on pharmaceutical drugs, by ATC group and NYHA class, is presented in Table 5.

The POLKARD study involved also inpatient facilities, for which the cost of an HF patient's single hospitalisation was estimated. The therapeutic procedures conducted during such hospitalisations, by NYHA classes of HF patients and by the reference levels of hospitals in which patients were hospitalised, are presented in the tables below. It is worth noting that because the number of NYHA I patients included in the analysis is small, the estimates based on this sample may differ from the actual consumption of resources for care of this class of patients (Tables 6, 7).

The average annual costs of an HF patient's treatment are presented in Figure 1, while Table 8 presents their breakdown into costs of different services, namely treatment in anaesthesiology and intensive care units, hospitalisations for HF, hospitalisation for other reasons (this item was accounted for, as concomitant diseases often result from a patient's chronic disease, which is often treated during hospitalisation

for other reasons), outpatient appointments, home visits and cost-generating diagnostic procedures.

Treatment of patients in AICUs accounts for the largest share of total costs. The higher the NYHA class of patients, the higher the share of the cost of AICU treatment; for NYHA IV, it is as much as 70% of total costs. Share of the costs of hospitalisation in other wards gradually decreases owing to a lower number of procedures being administered to patients with severe HF, and thus lower costs of non-AICU hospitalisation.

In the analysis conducted for the inpatient arm of the study, the cost of a single hospitalisation of a patient with HF was determined. The hospitalisation cost, by NYHA class of patients and by the reference level of hospitals in which patients were hospitalised, are presented in Table 9 and Table 10, respectively.

Estimating the unit cost of hospitalisation made it possible to determine the relation between the annual cost of hospitalisations and their number, as well as the impact of the cost of a single hospitalisation on the annual cost of treatment

**Table 3.** Annual consumption of resources: therapeutic procedures

Type of procedure	Average number of procedures per patient, annually (range)				
	NYHA I (n = 163)	NYHA II (n = 2,025)	NYHA III (n = 1,584)	NYHA IV (n = 174)	Total (n = 3,971)
Coronarography	0.27 (0–2)	0.17 (0–5)	0.14 (0–3)	0.13 (0–2)	0.16 (0–5)
Balloon angioplasty	0.09 (0–4)	0.07 (0–3)	0.05 (0–3)	0.01 (0–1)	0.06 (0–4)
Stent implantation	0.13 (0–3)	0.07 (0–3)	0.04 (0–2)	0.01 (0–1)	0.06 (0–3)
Coronary artery bypass grafting	0.03 (0–1)	0.03 (0–2)	0.02 (0–1)	0.02 (0–2)	0.03 (0–2)
Valve procedure	0.04 (0–2)	0.01 (0–2)	0.01 (0–1)	0.01 (0–1)	0.01 (0–2)
Single/dual chamber pacemaker implantation	0 (0–0)	0.00 (0–2)	0.00 (0–1)	0 (0–0)	0.00 (0–2)
Resynchronisation with biventricular stimulation	0 (0–0)	0.00 (0–1)	0.00 (0–1)	0.01 (0–1)	0.00 (0–1)
Cardioverter/defibrillator implantation	0.01 (0–1)	0.01 (0–2)	0.01 (0–2)	0.01 (0–1)	0.01 (0–2)

**Table 4.** Consumption of resources: treatment of heart failure patients in anaesthesiology and intensive care units

Item	Average number of days per patient during single hospitalisation (range)				
	NYHA I (n = 9)	NYHA II (n = 246)	NYHA III (n = 649)	NYHA IV (n = 366)	Total (n = 1,234)
Treatment in an intensive care unit	2.22 (0–11)	1.09 (0–12)	1.22 (0–29)	2.63 (0–35)	1.61 (0–35)
Treatment in an intensive care unit among patients requiring intensive care	5.00 (1–11)	3.89 (1–12)	4.24 (1–29)	5.37 (1–35)	4.67 (1–35)

**Table 5.** Pharmaceutical drugs

Group of drugs (ATC code)	Cost of drugs (NHF's perspective), in PLN				
	NYHA I (n = 163)	NYHA II (n = 2,025)	NYHA III (n = 1,585)	NYHA IV (n = 175)	Total (n = 3,948)
Platelet aggregation inhibitors (B01AC)	16.97	15.29	14.43	15.17	15.01
Digitalis glycosides (C01AA)	2.74	4.83	8.14	10.13	6.31
Diuretics (C03)	28.70	52.55	77.33	109.00	64.01
Beta-blocking agents (C07)	18.21	20.24	16.30	9.87	18.11
Angiotensin converting enzyme inhibitors (C09AA)	82.29	72.58	66.66	64.15	70.23
Total	148.92	165.48	182.86	208.33	173.67

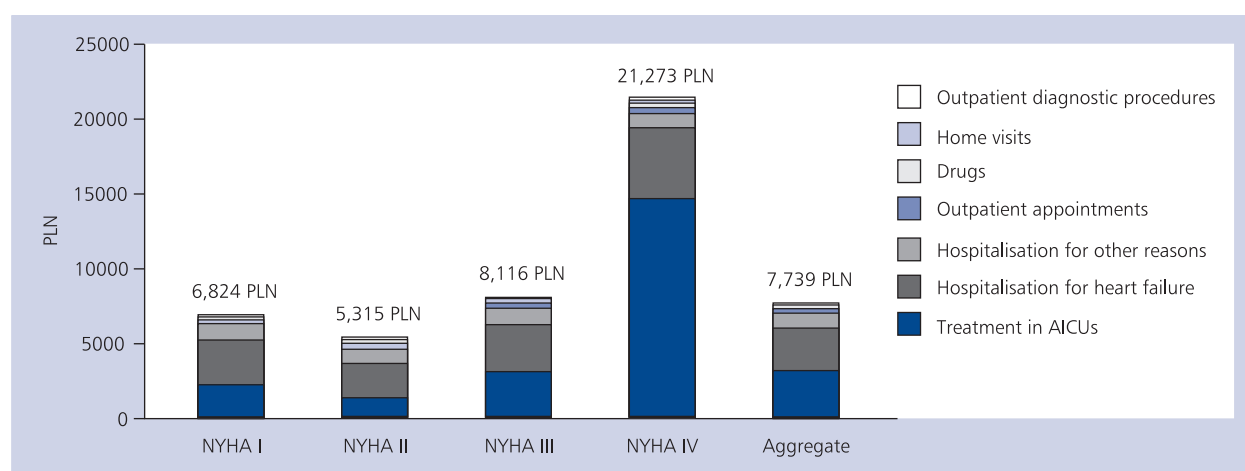
Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN

**Table 6.** Consumption of resources for heart failure patient hospitalisation: therapeutic procedures by NYHA class

Type of procedure	Average number of procedures per patient during single hospitalisation (range)				
	NYHA I (n = 9)	NYHA II (n = 246)	NYHA III (n = 649)	NYHA IV (n = 366)	Total (n = 1,283)
Coronarography	0.125 (0–1)	0.0935 (0–2)	0.0647 (0–2)	0.0273 (0–1)	0.0608 (0–2)
Balloon angioplasty	0.2222 (0–1)	0.0254 (0–1)	0.0175 (0–2)	0.0172 (0–2)	0.0211 (0–2)
Stent implantation	0.2222 (0–1)	0.0338 (0–1)	0.0254 (0–2)	0.0115 (0–1)	0.0251 (0–2)
Coronary artery bypass grafting	0 (0–0)	0.0042 (0–1)	0.0016 (0–1)	0.0112 (0–1)	0.0048 (0–1)
Valve procedure	0 (0–0)	0 (0–0)	0.0015 (0–1)	0.0028 (0–1)	0.0016 (0–1)

**Table 7.** Consumption of resources for heart failure patient hospitalisation: therapeutic procedures by hospital reference level

Type of procedure	Average number of procedures per patient during single hospitalisation (range)				
	City hospital wards (n = 304)	District hospital wards (n = 556)	Regional hospital wards (n = 292)	Clinical wards of medical universities (n = 128)	Total (n = 1,283)
Coronarography	0.0197 (0–1)	0.0018 (0–1)	0.1483 (0–2)	0.2188 (0–1)	0.0608 (0–2)
Balloon angioplasty	0.0137 (0–2)	0.0037 (0–1)	0.0427 (0–2)	0.0708 (0–1)	0.0211 (0–2)
Stent implantation	0.0205 (0–2)	0.0037 (0–1)	0.0432 (0–2)	0.0973 (0–1)	0.0251 (0–2)
Coronary artery bypass grafting	0.0034 (0–1)	0 (0–0)	0.0141 (0–1)	0.008 (0–1)	0.0048 (0–1)
Valve procedure	0 (0–0)	0 (0–0)	0.0034 (0–1)	0.0081 (0–1)	0.0016 (0–1)

**Figure 1.** Average annual costs of heart failure patient's treatment by NYHA class; AICU — anesthesiology and intensive care units; Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN**Table 8.** Average annual costs of heart failure patient's treatment: detailed breakdown

Cost item	Average annual costs of treatment per patient, in PLN				
	NYHA I	NYHA II	NYHA III	NYHA IV	Total
Treatment in AICUs	2,181.83	1,504.87	3,279.82	14,800.86	3,360.34
Hospitalisation for heart failure	2,971.94	2,321.77	3,054.55	4,732.18	2,748.49
Hospitalisation for other reasons	1,117.47	936.97	1,085.28	834.38	1,005.91
Outpatient appointments	331.88	324.43	399.86	498.86	362.88
Home visits	40.22	39.26	100.56	187.01	70.17
Outpatient diagnostic procedures	32.00	21.84	12.68	11.55	18.02
Drugs	148.92	165.48	182.86	208.33	173.67
Total cost	6,824.92	5,314.62	8,115.61	21,273.33	7,739.49

AICU — anaesthesiology and intensive care units; Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN

of NYHA I patients (in fact, high annual cost of treatment of such patients results from costly interventions in them, which add to the cost of hospitalisation itself).

The average costs of hospitalisation grew with the hospital reference level.

## DISCUSSION

The costs of diagnostic and therapeutic procedures used in the treatment of HF, from the public payer's perspective, were estimated in this study. Owing to the random selection of both inpatient and outpatient facilities, the sample was representa-



**Table 9.** Average costs of heart failure patient's hospitalisation, by NYHA class: detailed breakdown

Cost item	Average costs of heart failure patient's hospitalisation				
	NYHA I	NYHA II	NYHA III	NYHA IV	Total
Treatment in AICU	6,777.60	3,321.31	3,705.56	8,026.80	4,907.31
Hospitalisation	3,706.87	2,575.65	2,457.96	2,615.01	2,538.86
Total cost	10,484.48	5,896.96	6,163.52	10,641.81	7,446.17

AICU — anaesthesiology and intensive care units; Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN

**Table 10.** Average costs of heart failure patient's hospitalisation, by hospital reference level: detailed breakdown

Cost item	Average costs of heart failure patient's hospitalisation				
	City hospital wards	District hospital wards	Regional hospital wards	Clinical wards of medical universities	Total
Treatment in AICU	4,590.50	4,273.83	5,350.93	7,881.21	4,907.31
Hospitalisation	2,451.78	2,339.73	2,797.51	3,045.89	2,538.86
Total cost	7,042.28	6,613.56	8,148.44	10,927.11	7,446.17

AICU — anaesthesiology and intensive care units; Ex. rate from 05.03.2012: 1 EUR = 4.14 PLN

tive at this level and typical of care for HF patients in Poland. The analysis of individual cost items matches the data for other countries and indicates that the main cost component is hospitalisation, followed by medical appointments, laboratory tests and others [18, 19]. This data is an indirect confirmation of the NHF's reports, in which the two diagnoses (ICD-10) associated with the highest costs, in populations of men and women aged over 65, are related to HF [20]. The elderly population consumes approximately three quarters of the overall resources used for the treatment of this disease [21]. The total medical costs of treatment increase with NYHA class, if NYHA I and II patients are considered jointly. With this assumption, the results match the data for France, Germany, Belgium and the Netherlands [19]. This study demonstrated that treatment of NYHA I patients involved higher expenditure compared to NYHA II and III patients. This may be attributable to the highest number of specialist procedures (cardiology interventions) in this group, and thus the highest costs. In medical terms, such interventions may inhibit the progress of the disease in its early stages, as it is often stimulated by other heart diseases which ultimately lead to HF. A maximalist approach applied in the cost analysis (i.e. associating each procedure with a separate hospitalisation) did not significantly affect the final results thereof. A minimalist approach (i.e. assuming zero costs of coronarography and angioplasty by including them in the costs of hospitalisation for other reasons) led to a difference of less than PLN 100 in the estimate of the total annual costs of treatment (compared to a maximalist approach).

In the inpatient population, direct medical costs of an HF patient's single hospitalisation grow with the hospital reference level, from the lowest in city hospitals to the highest in university hospitals. This trend would have been even

stronger, if reference level-dependent unit costs, rather than average costs of hospitalisation, had been used in calculations. Such results are consistent with the general assumption that expenditure on treatment in more specialised facilities is higher. The time of hospitalisation of patients included in the POLKARD study was slightly longer than indicated by the US data [22] and slightly shorter than in the UK [19], while the time of treatment in AICUs was almost the same [22]. This is an indirect indication that global standards of duration of hospital treatment of HF patients have been achieved in Poland. Data concerning unit costs of drugs was not updated due to constant changes in the reimbursement scheme of particular medicines (leading to changes in the consumption pattern) and due to the fact that this was not a major cost component from the payer's perspective (unlike the patient's perspective, as the percentage of out-of-pocket spending for these drugs was even higher than the average co-payment rate for all drugs in Poland, which is the highest in the European Union in itself).

### Limitations of the study

As for the limitations of the study, no indirect costs were accounted for (these will be subject to separate analysis). These costs are potentially of great importance in Poland, as only 23% of Polish HF patients of working age remain professionally active [23]. Sampling of hospitals, outpatient clinics and doctors (not patients) most probably led to epidemiological underestimation of NYHA I patients — the results for this group of patients should be treated with caution. Moreover, it would be useful to conduct an analysis of subpopulations, e.g. patients with co-morbidities like diabetes or with systolic dysfunction (the majority), excluding the least advanced stage

of the disease (NYHA I), without arrhythmia (40.4% meeting all these criteria), or including them (49.7%, as a separate criterion), as well as costs associated with such subpopulations. Such an approach would facilitate the selection of subpopulations posing the heaviest financial burden and, consequently, offering the greatest room for rationalisation of expenses. Finally, extrapolation of resource consumption from a different point in time to combine this data with the current unit costs may pose a risk of not accounting for changes in the management of HF patients and the financing scheme made during this period (more intensive resource use leading to underestimation of the results). On the other hand however, using the lowest cardiologist's consultation fee may lead to overestimation of this cost group. Due to the limited scope of this study, other perspectives were not analysed. Acknowledging the aforementioned limitations, it should be emphasised that this is the most comprehensive and largest sample study of the costs of this disease in Poland.

## CONCLUSIONS

To sum up, the direct costs of an HF patient's treatment in Poland ranged from PLN 3,373.23 to 7,739.49 in 2011, depending on the assumptions made (inclusion/exclusion of additional hospitalisations; avoidance of double payment for treatment in AICU and hospital). Assuming a conservative estimation of the Polish treated population of HF patients at 220,000 [24], real unit cost from POLKARD and data reported by NHF, the costs for the healthcare system could reach PLN 1,703 million, which is 3.16% of the NHF's budget. Owing to the fact that HF constitutes such a significant economic burden on both the healthcare system and patients themselves, monitoring of trends in this area seems crucial. Due to ageing of the Polish population, one can expect higher morbidity of HF. More research in this area is needed aimed at the proper allocation of limited resources, which will remain a challenge for all parties involved in the treatment of this disease in Poland.

**Conflict of interest:** none declared

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# Koszty niewydolności serca w Polsce z punktu widzenia płatnika.

Program oceny diagnostyki, leczenia i kosztów u chorych z niewydolnością serca w losowo wybranych jednostkach lecznictwa otwartego i zamkniętego na poziomie podstawowym, wojewódzkim i specjalistycznym: POLKARD

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## Streszczenie

**Wstęp:** Niewydolność serca (HF) jest przewlekłą chorobą o istotnym znaczeniu klinicznym i ekonomicznym zarówno dla systemu ochrony zdrowia, jak i samych pacjentów.

**Cel:** Celem badania było określenie zużycia zasobów medycznych na leczenie i opiekę nad pacjentem z HF oraz oszacowanie kosztów z tym związanych.

**Metody:** Badanie swym zasięgiem objęło 400 praktyk lekarzy ogólnych/rodzinnych i 396 przychodni specjalistycznych, 259 szpitali wszystkich poziomów referencyjnych. Próba była reprezentatywna, uzupełniona danymi z wywiadów z pacjentami. Na podstawie zużycia poszczególnych zasobów i kosztów jednostkowych świadczeń z 2011 r. oszacowano koszty opieki nad pacjentem z HF w Polsce. Wykonano osobne analizy w zależności od stopnia nasilenia choroby (wg klas NYHA I–IV); w obliczeniach przyjęto perspektywę płatnika publicznego.

**Wyniki:** Bezpośrednie koszty leczenia pacjenta z HF w Polsce mogą wynosić średnio od 3373,23 do 7739,49 PLN (2011). Główną składową tych kosztów jest hospitalizacja. Całkowity koszt dla systemu ochrony zdrowia może wynieść 1703 mln PLN, co stanowi 3,16% budżetu NFZ.

**Wnioski:** Koszty leczenia HF w Polsce są wysokie, właściwa alokacja zasobów w zakresie diagnostyki i leczenia może się przyczynić do racjonalizacji przeznaczanych na ten cel wydatków.

**Słowa kluczowe:** niewydolność serca, koszty, POLKARD, ekonomika zdrowia

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