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# Predictors of one-year outcome in patients hospitalised for heart failure: results from the Polish part of the Heart Failure Pilot Survey of the European Society of Cardiology

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## Abstract

**Background:** Over the last few decades, the incidence and prevalence of chronic heart failure (HF) have been constantly increasing.

**Aim:** To identify predictors of one-year mortality and hospital readmissions in patients discharged after hospitalisation for HF.

**Methods:** The study included Polish patients who agreed to participate in the Heart Failure Pilot Survey of the European Society of Cardiology and were followed for 12 months. The primary endpoint was all-cause death at 12 months. The secondary endpoint was a composite of all-cause death and readmission for cardiac causes at 12 months.

**Results:** The final analysis included 629 patients. The primary end point occurred in 68 of 629 patients (10.8%). In multivariate analysis, independent predictors of one-year mortality were: higher New York Heart Association (NYHA) class at admission (odds ratio [OR] 1.90; 95% confidence interval [CI] 1.01–3.59; p = 0.0478), inotropic support during hospitalisation (OR 3.95; 95% CI 1.49–10.47; p = 0.0056), and lower glomerular filtration rate at discharge (OR 0.978; 95% CI 0.961–0.995; p = 0.0117). The secondary endpoint occurred in 278 of 503 patients (55.3%). In multivariate analysis, predictors of secondary endpoint were a history of previous coronary revascularisation (OR 2.403; 95% CI 1.221–4.701; p = 0.002) and inotropic support during hospitalisation (OR 2.521; 95% CI 1.062–5.651; p = 0.009).

**Conclusions:** Patients discharged after hospitalisation for HF remained at high risk of death and hospital readmission. A previous history of coronary revascularisation, decreased renal function, and worse clinical status at admission with the need for inotropic support were predictors of one-year outcome in Polish patients hospitalised for HF.

**Key words:** heart failure, hospitalisation, inotropic support, prognosis, registry

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## INTRODUCTION

Over the last few decades, the incidence and prevalence of chronic heart failure (HF) have been constantly increasing. This is the result of growing life expectancy and aging of modern societies, as well as advances in the treatment of acute coronary syndromes, which lead to an increased number of survivors with left ventricular (LV) dysfunction [1]. HF has become the leading cause of hospitalisation in patients older than 65 years [2]. Death rates appear excessive both during and after hospitalisation. High readmission rates reveal the failure of admission of guidelines that would result in effective long-term care [2]. These facts on the morbidity associated with HF are uncontested. Moreover, data on the clinical characteristics of patients and the impact of management on outcomes during admission are incomplete. Most information is derived from single-centre studies, clinical trials, and real-life registries, including the Euro-

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Heart Failure Survey II, ADHERE, and ATTEND [3–5]. However, the recent advancement in HF treatment that includes diagnostic methods, pharmacotherapy, and interventional treatment are likely to change the patients' profile and risk predictors for mortality and rehospitalisation. The aim of the Heart Failure Pilot Survey of the European Society of Cardiology (ESC) was to assess the clinical profile, pharmacotherapy, and one-year outcome in HF patients across Europe [6, 7].

The aim of our study was to identify predictors of one-year mortality and hospital readmissions in the Polish cohort enrolled in the Heart Failure Pilot Survey.

## METHODS

### *Study population*

The study included Polish patients discharged after hospitalisation for HF, who agreed to participate in the Heart Failure Pilot Survey of the ESC. It was a prospective, multicentre, observational survey of HF patients that was conducted in 12 European countries [7]. The survey enrolled adults (i.e. over 18 years old) with HF — both, outpatients with HF seen in ambulatory care, as well as patients admitted to hospital for acute or chronic HF. The diagnosis of HF was based on clinical (typical HF signs and symptoms), biochemical (increased concentrations of N-terminal pro-B-type natriuretic peptide [NT-proBNP] ≥ 125 pg/mL or B-type natriuretic peptide [BNP] ≥ 35 pg/mL), and echocardiographic findings (LV dysfunction, not obligatory). There were no specific exclusion criteria other than lack of informed consent.

Data were gathered by 136 European cardiology centres, including 29 centres from Poland, i.e. approx. 12% of all hospitals with acute cardiac care units. The methodology of the study has been described in a previous publication [8].

Approval for the study by the local Ethical Review Board was obtained in accordance with the rules of each participating country. Signed informed consent was required from each of the involved patients after providing them with detailed information about the study.

The current analysis included only Polish patients of the Heart Failure Pilot Survey, who were hospitalised and then followed for 12 months [9]. Patients who died during hospitalisation were not included in the current analysis. During one-year observation data on deaths and all the readmissions were collected.

### *Study endpoints*

The primary endpoint was all-cause death at 12 months after discharge. The secondary endpoint was a composite of all-cause death and readmissions for cardiac causes at 12 months.

### *Statistical analysis*

Categorical data were presented as numbers of patients and percentages. For continuous variables, median value and interquartile range were used. Fisher's exact test and Mann-Whitney U test were performed for the comparison of both groups, for categorical variables, and continuous variables, respectively. To determine the risk factors of primary and secondary endpoints, logistic regression analysis was performed. All factors that were found to be statistically significant in univariate analyses were included into multivariate logistic regression analysis. Statistical significance was considered for p values lower than 0.05 for all tests. Statistical analyses were performed using SAS software, version 9.2.

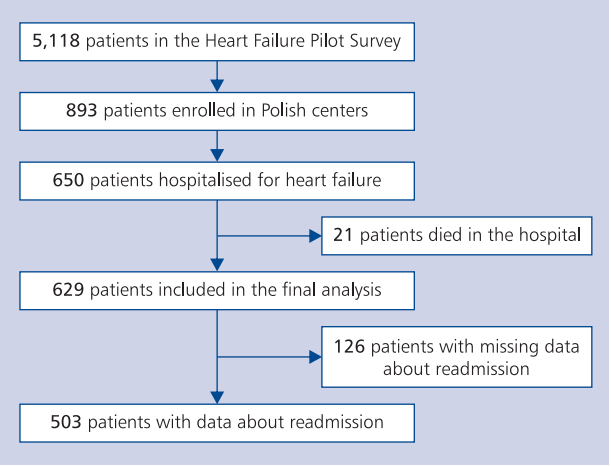


Figure 1. The flow chart of patient enrolment in the study

## RESULTS

### *Study group selection*

The Heart Failure Pilot Survey enrolment started in October 2009 and was completed in May 2010. A total of 5,118 patients were included across Europe, 893 of them were enrolled in Polish centres. In the Polish cohort of the registry there were 650 patients admitted to the hospital. The final analysis included 629 patients — 21 patients who died in hospital were excluded from the analysis. Data on one-year survival were available for all of the patients. Data on secondary endpoint were available for 503 patients. This group included 480 patients with data on rehospitalisation and deaths and 23 patients who died during follow-up without data on rehospitalisation. For the remaining population (126 patients) there were no data on rehospitalisation, and those patients survived for one year. The flow chart of patient enrolment in the study is shown in Figure 1.

### *Study group characteristics*

The median age in the analysed group was 69 years old, and 64.7% of the patients were male. Most patients had a prior history of HF (57.8%), mainly of ischaemic aetiology (60.4%). Thirty-eight per cent of patients had a history of atrial fibrillation and 33.5% — of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). The causes

of HF decompensation leading to index hospitalisation included: acute coronary syndrome in 31.0%, atrial fibrillation in 16.3%, uncontrolled hypertension in 14.6%, HF treatment non-compliance in 13.1%, infection in 8.7%, renal dysfunction in 7.9%, anaemia in 5.1%, ventricular arrhythmia in 4.0%, bradyarrhythmia in 3.0%, iatrogenic causes in 1.1%, and "other" causes in 38.3% of patients (with a possibility to name more than one triggering factor of worsening HF for each patient). Patient demographics, characteristics, and differences between patients who developed primary or secondary endpoint are summarised in Table 1.

### *Primary endpoint*

The primary endpoint occurred in 68 patients (10.8% of the study group). Cardiovascular deaths accounted for 70.4% of total deaths, non-cardiovascular deaths — for 3.7%, while an unknown cause was reported in 25.9% of the cases. In univariate analysis the risk factors for death in one-year follow-up were: older age, history of atrial fibrillation, ischaemic aetiology of HF, previous PCI or CABG, worse clinical status (higher New York Heart Association [NYHA] class) at hospital admission, increased requirement for inotropic support during hospitalisation, lower systolic blood pressure (SBP) and diastolic blood pressure, and lower glomerular filtration rate (GFR) at discharge, as shown in Table 2. Gender, diabetes, tobacco smoking, thyroid dysfunction, and peripheral vascular disease were not predictors of mortality (data not shown).

Interestingly, patients who were at higher risk of one-year mortality were often taking suboptimal doses of angiotensin-converting enzyme inhibitors (ACEI), beta-blockers, or aldosterone receptor antagonists at the time of discharge.

In multivariate analysis, predictors of one-year mortality were: higher NYHA class at hospital admission (odds ratio [OR] 1.90; 95% confidence interval [CI] 1.01–3.59; p = 0.0478), inotropic support during hospitalisation (OR 3.95; 95% CI 1.49–10.47; p = 0.0056), and lower GFR at discharge (OR 0.978; 95% CI 0.961–0.995; p = 0.0117). A trend was observed for history of ischaemic heart disease and neglecting treatment with ACEI as predictive of one-year mortality.

Multivariable predictors of one-year clinical outcomes are shown in Table 3.

### *Secondary endpoint*

The secondary endpoint occurred in 278 of 503 patients (55.3%). From 480 patients whose data on rehospitalisation were available, 53.1% were readmitted at least once for any cause during the one-year follow-up; 83.1% were readmitted for cardiovascular causes and 20.4% for non-cardiovascular causes, while hospitalisations due to HF accounted for 47.8% of total hospitalisations.

In univariate analysis the risk factors for the secondary endpoint were: a history of PCI/CABG, previous HF hospitalisation, lower ejection fraction, higher NYHA class at admission, more frequent use of inotropic support during hospitalisation, and the use of aldosterone antagonists and anticoagulants at discharge.

In multivariate analysis, predictors of secondary endpoint were a history of previous coronary revascularisation (OR 2.403; 95% CI 1.221–4.701; p = 0.002) and inotropic support during hospitalisation (OR 2.521; 95% CI 1.062–5.651; p = 0.009).

## DISCUSSION

The Heart Failure Pilot Survey of the ESC is an epidemiological multicentre study of patients hospitalised for HF in Europe. It gives a unique insight into the characteristics of patients hospitalised for HF in Europe, including Poland. These data confirm that HF is a chronic disease with ischaemic aetiology in over 60% of Polish hospitalised patients, which is slightly higher than in other registries (ATTEND: 33%, ADHERE: 57%, EHFS-II: 30%, OPTIMIZE-HF: 46%) [3–5, 10]. Race and ethnic variations may be responsible for the differences in the causes of HF because the prevalence of ischaemic heart disease was also low in the studies held in Japan [3]. However, in the whole ESC HF Pilot registry the prevalence of ischaemic heart disease was lower than in Poland, at 50.7%. Patients included into the large American national OPTIMIZE-HF registry were also older compared to Polish patients with HF [10]. Development of HF at a younger age in the Polish population may reflect inadequate prevention and suboptimal treatment of diseases leading to this clinical syndrome.

Numerous randomised controlled trials have shown that ACEI, angiotensin receptor blockers, and beta-blockers improve the survival of patients with HF. The proportions of Polish patients actually receiving these drugs in the present study were 74.4%, 8.8%, and 88.2%, respectively. Those results are consistent with the data gathered from the ESC HF Pilot Survey in Eastern Europe [7].

### *One-year outcomes*

While survival of patients with chronic HF seems to improve slowly over years, according to our data both in-hospital and one-year outcomes of patients admitted for acute HF are still very high [11, 12]. This can be explained by the fact that in-hospital therapeutic approaches to these patients have remained unchanged during recent decades. In contrast, several trials have been conducted in patients with chronic HF, allowing the inclusion of effective treatments in the recommendations of the current international guidelines widely adopted in clinical practice [13]. This is probably the most important reason for the observed improvement in outcomes. The one-year mortality rate of hospitalised HF patients in Poland was 10.8% (68 of 629 patients died in one-year observation) while in the whole registry it was 17.4% for Europe. For northern, eastern, southern and western Europe, one-year mortality rates were: 19.3%, 13%, 24.7%, and 18.4%

Table 1. Baseline characteristics of patients who survived and patients who died in one-year follow-up. Continuous and ordinal variables are shown as a median value and interquartile range

| Characteristics | Total Median (IQR)/% | Primary endpoint | | P | Secondary endpoint | | P |
|---|---|---|---|---|---|---|---|
| | | Died (68/629 = 10.81%) | Alive (561/629 = 89.19%) | | Died or rehospitalisation (278/503 = 55.27%) | Alive without rehospitalisation (225/503 = 44.73%) | |
| **Demographics** | | | | | | | |
| Age [years] | 69 (58–77) | 74 (63–81) | 69 (58–77) | 0.0008 | 69 (58–77) | 71 (59–78) | 0.3 |
| BMI [kg/m$^2$] | 27.7 (24.7–31.3) | 26.6 (23.2–29.4) | 27.7 (24.8–31.3) | 0.08 | 27.7 (24.7–31.1) | 28.1 (25.0–31.6) | 0.5 |
| **HF** | | | | | | | |
| LVEF [%] | 37 (27–50) | 34 (25–46) | 38 (27–50) | 0.1 | 37 (25–47) | 38 (30–52) | 0.03 |
| Previous hospitalisation for HF | 57.8% | 61.8% | 57.3% | 0.5 | 63.7% | 52.7% | 0.01 |
| **Aetiology of HF** | | | | | | | |
| Ischaemic | 60.4% | 76.5% | 58.5% | 0.004 | 64.0% | 63.1% | 0.9 |
| **Previous medical history** | | | | | | | |
| Previous stroke or TIA | 9.7% | 2.9% | 10.6% | 0.049 | 10.4% | 8.9% | 0.7 |
| Atrial fibrillation | 38.3% | 50.0% | 36.9% | 0.047 | 41.4% | 34.7% | 0.1 |
| Ischaemic heart disease or MI | 58.4% | 70.6% | 57.0% | 0.04 | 58.3% | 55.8% | 0.6 |
| Previous PCI or CABG | 33.5% | 45.6% | 32.0% | 0.03 | 41.0% | 25.0% | < 0.0001 |
| NYHA class at admission | 3 (2–3) | 3 (3–4) | 3 (2–3) | 0.003 | 3 (3–4) | 3 (2–3) | 0.009 |
| **Clinical findings at discharge** | | | | | | | |
| Systolic BP [mm Hg] | 120 (110–130) | 113 (100–130) | 120 (110–130) | 0.01 | 120 (110–130) | 120 (110–130) | 0.09 |
| Diastolic BP [mm Hg] | 70 (65–80) | 70 (60–80) | 70 (68–80) | 0.02 | 70 (65–80) | 74 (70–80) | 0.1 |
| HR [bpm] | 70 (66–80) | 70.5 (70.0 –80.0) | 70 (66–80) | 0.3 | 70 (68–80) | 70 (66–80) | 0.4 |
| Sodium concentration [mmol/L] | 138.0 (136.0–140.4) | 137.0 (135.0–139.8) | 138.0 (136.0–140.6) | 0.04 | 138.0 (135.0–141.0) | 138.2 (136.0–140.5) | 0.6 |
| eGFR [mL/min/1.73 m$^2$] | 65.4 (45.6–89.1) | 53.2 (31.0–75.8) | 68.3 (47.4–90.8) | 0.0005 | 63.9 (44.7–85.4) | 69.9 (45.4–88.8) | 0.4 |
| **Hospital management** | | | | | | | |
| Inotropic agents | 9.7% | 27.9% | 7.5% | 0.0001 | 14.4% | 5.4% | 0.001 |
| Nitrates *i.v.* | 15.3% | 14.7% | 15.4% | 1.0 | 14.8% | 15.2% | 0.9 |
| Diuretics *i.v.* | 77.7% | 80.88% | 77.3% | 0.6 | 78.7% | 71.6% | 0.08 |
| **Medication at discharge** | | | | | | | |
| ACEI | 74.4% | 64.7% | 75.6% | 0.06 | 71.2% | 76.4% | 0.2 |
| ARB | 8.8% | 5.9% | 9.1% | 0.5 | 9.4% | 9.9% | 0.9 |
| Beta-blockers | 88.2% | 85.5% | 88.4% | 0.7 | 87.8% | 87.1% | 0.9 |
| Aldosterone antagonists | 64.2% | 63.2% | 63.8% | 1.0 | 68.8% | 58.3% | 0.02 |
| Diuretics | 80.4% | 85.3% | 79.9% | 0.3 | 83.5% | 76.4% | 0.06 |
| Statins | 70.0% | 73.1% | 69.6% | 0.7 | 70.8% | 68.8% | 0.6 |
| Antiplatelets | 70.8% | 70.1% | 70.9% | 0.9 | 69.0% | 70.5% | 0.8 |
| Anticoagulants | 38.5% | 43.3% | 37.9% | 0.4 | 43.7% | 33.9% | 0.03 |

ACEI — angiotensin-converting-enzyme inhibitor; ARB — angiotensin receptor blocker; BMI — body mass index; BP — blood pressure; CABG — coronary artery bypass surgery; eGFR — estimated glomerular filtration rate; HF — heart failure; HR — heart rate; IQR — interquartile range, LVEF — left ventricular ejection fraction; MI — myocardial infarction; NYHA — New York Heart Association; PCI — percutaneous coronary intervention; TIA — transient ischaemic attack

Table 2. Univariate analyses of predictors for the long-term clinical outcomes

| Variable | Primary endpoint | | Secondary endpoint | |
|---|---|---|---|---|
| | OR (95% CI) | P | OR (95% CI) | P |
| Age [1 year] | 1.04 (1.02–1.06) | 0.0009 | 1.0 (0.98–1.01) | 0.5 |
| Men | 0.81 (0.48–1.36) | 0.42 | 1.39 (0.96–2.0) | 0.08 |
| BMI [kg/m$^2$] | 0.94 (0.89–1.0) | 0.049 | 1.0 (0.96–1.03) | 0.65 |
| LVEF [%] | 0.98 (0.96–1.01) | 0.1 | 0.99 (0.97–1.0) | 0.03 |
| Previous hospitalisation for HF | 1.20 (0.72–2.02) | 0.5 | 1.57 (1.10–2.25) | 0.01 |
| Previous stroke or TIA | 0.26 (0.06–1.08) | 0.06 | 1.19 (0.65–2.16) | 0.6 |
| History of atrial fibrillation | 1.71 (1.03–2.84) | 0.04 | 1.33 (0.92–1.91) | 0.1 |
| Ischaemic heart disease or MI | 1.81 (1.05–3.14) | 0.03 | 1.11 (0.78–1.58) | 0.6 |
| Previous PCI or CABG | 1.78 (1.07–2.96) | 0.03 | 2.09 (1.42–3.07) | 0.0002 |
| NYHA class at admission | 1.73 (1.20–2.49) | 0.003 | 1.36 (1.07–1.74) | 0.01 |
| **Clinical findings at discharge** | | | | |
| Systolic BP [mm Hg] | 0.98 (0.96–1.0) | 0.02 | 0.99 (0.98–1.0) | 0.05 |
| Diastolic BP [mm Hg] | 0.97 (0.95–1.0) | 0.03 | 0.99 (0.97–1.01) | 0.2 |
| Sodium concentration [mmol/L] | 0.95 (0.89–1.01) | 0.08 | 0.98 (0.93–1.04) | 0.5 |
| eGFR [mL/min/1.73 m$^2$] | 0.98 (0.97–0.99) | 0.0009 | 1.0 (0.99–1.0) | 0.3 |
| **Hospital management** | | | | |
| Inotropic agents | 4.78 (2.58–8.86) | 0.0001 | 2.97 (1.52–5.81) | 0.002 |
| **Medication at discharge** | | | | |
| ACEI | 0.59 (0.35–1.01) | 0.05 | 0.76 (0.51–1.14) | 0.2 |
| ARB | 0.63 (0.22–1.81) | 0.4 | 0.95 (0.52–1.78) | 0.9 |
| Beta-blockers | 0.86 (0.41–1.81) | 0.7 | 1.06 (0.63–1.80) | 0.8 |
| Aldosterone antagonists | 1.0 (0.59–1.70) | 1.0 | 1.58 (1.09–2.29) | 0.01 |
| Diuretics | 1.46 (0.73–2.95) | 0.3 | 1.55 (1.0–2.42) | 0.05 |
| Statins | 1.19 (0.67–2.10) | 0.6 | 1.10 (0.75–1.61) | 0.6 |
| Antiplatelets | 0.97 (0.55–1.68) | 0.9 | 0.93 (0.63–1.36) | 0.7 |
| Anticoagulants | 1.25 (0.75–2.09) | 0.4 | 1.51 (1.05–2.18) | 0.03 |

CI — confidence interval; ACEI — angiotensin-converting-enzyme inhibitor; ARB — angiotensin receptor blocker; BP — blood pressure; BMI — body mass index; CABG — coronary artery bypass surgery; eGFR — estimated glomerular filtration rate; HF — heart failure; LVEF — left ventricular ejection fraction; MI — myocardial infarction; NYHA — New York Heart Association; OR — odds ratio; PCI — percutaneous coronary intervention; TIA — transient ischaemic attack

respectively. The lower mortality in Polish hospitalised patients may be associated with the fact that there are few outpatient HF clinics in Poland. Due to this fact, patients hospitalised in Polish hospitals may have less severe advancement of HF.

In our analysis several risk factors were detected that can effectively identify patients at higher and lower risk of post-discharge clinical events. The determinants of all-cause mortality observed in our study were different from those described in previous studies conducted in hospitalised HF patients, including the population of European patients from the ESC HF Pilot registry [2, 7, 14–17]. In previous studies conducted in Europe and the United States, age, renal function, ejection fraction, and SBP are confirmed to be relevant prognostic markers in hospitalised patients, as well as the presence of pulmonary or peripheral congestion. This suggests the need to discharge patients only when signs of congestion are completely resolved and, when this is not possible, specifically to monitor and intensively care for those patients who are at high risk of subsequent events. In the Polish population of the ESC HF Pilot Survey the independent risk factors for death during one year of observation were: higher NYHA class at hospital admission, inotropic support during hospitalisation, and renal failure described as lower GFR. In the Korean HF registry the independent clinical risk factors included age, previous history of HF, anaemia, hyponatraemia, a high NT-proBNP level, and taking beta-blockers at discharge [18]. In the OPTIMIZE-HF study the 60- to 90-day post-discharge mortality rate was 8.6%, and 29.6% of patients were re-hospitalised. Factors predicting early post-discharge mortality included age, serum creatinine, reactive airway disease, liver disease, lower SBP,

Table 3. Multivariate analysis of predictors of death at one year

| Variable | Primary endpoint | |
|---|---|---|
| | OR (95% CI) | P |
| Age [years] | 0.99 (0.95–1.04) | 0.9 |
| Body mass index [kg/m$^2$] | 1.03 (0.96–1.11) | 0.4 |
| History of atrial fibrillation | 1.71 (0.79–3.71) | 0.2 |
| Ischaemic heart disease or MI | 2.55 (0.97–6.74) | 0.06 |
| Previous PCI or CABG | 1.38 (0.60–3.15) | 0.5 |
| NYHA class at admission | 1.90 (1.01–3.59) | 0.0478 |
| Systolic BP [mm Hg] at discharge | 0.99 (0.95–1.02) | 0.4 |
| Diastolic BP [mm Hg] at discharge | 0.97 (0.92–1.01) | 0.2 |
| eGFR at discharge [mL/min/1.73 m$^2$] | 0.98 (0.96–0.99) | 0.0117 |
| Inotropic agents in hospital | 3.96 (1.49–10.47) | 0.0056 |
| ACEI at discharge | 0.49 (0.23–1.06) | 0.07 |

CI — confidence interval; ACEI — angiotensin-converting-enzyme inhibitor; BP — blood pressure; CABG — coronary artery bypass surgery; eGFR — estimated glomerular filtration rate; MI — myocardial infarction; NYHA — New York Heart Association; OR — odds ratio; PCI — percutaneous coronary intervention

Table 4. Multivariate analysis of predictors of death or rehospitalisation for heart failure at one year

| Variable | Secondary endpoint | |
|---|---|---|
| | OR (95% CI) | P |
| Left ventricular ejection fraction | 1.003 (0.988–1.018) | 0.71 |
| Previous hospitalisation for HF | 0.807 (0.530–1.230) | 0.32 |
| Previous PCI or CABG | 2.403 (1.221–4.701) | 0.002 |
| NYHA class at admission | 1.011 (0.711–1.652) | 0.51 |
| Inotropic agents in hospital | 2.521 (1.062–5.651) | 0.009 |
| Aldosterone antagonists at discharge | 0.681 (0.447–1.037) | 0.07 |
| Anticoagulants at discharge | 0.789 (0.524–1.186) | 0.26 |

CI — confidence interval; CABG — coronary artery bypass surgery; HF — heart failure; NYHA — New York Heart Association; OR — odds ratio; PCI — percutaneous coronary intervention

lower serum sodium, lower admission weight, and depression. Use of statins and beta-blockers at discharge was associated with significantly decreased mortality. In OPTIMIZE-HF, SBP was the most important determinant of post-discharge mortality; it was also highly predictive of death or rehospitalisation. Lower SBP was associated with higher risk of both outcomes, perhaps because SBP may be a marker of poor cardiac output in this setting, thus signalling a higher-risk patient [19]. In our study lower SBP was a significant risk factor for death in one-year observation only in univariate analysis.

On the other hand, the risk factors for the occurrence of secondary endpoint (death or rehospitalisation) were a history of previous PCI/CABG and inotropic support during hospitalisation. This probably results from the fact that patients with HF, who require revascularisation are in more severe condition with significantly worse function of the LV, which is closely related with the less favourable outcomes. The same endpoint occurred in 31% of patients from the IMPACT-HF study, but during 60 days of observation. In our analysis this endpoint occurred in 53.1% of patients, but in one-year follow-up. The most important predictors for the combined endpoint of death or rehospitalisation in the OPTIMIZE-HF study were admission serum creatinine, SBP, admission haemoglobin, discharge use of ACEI or angiotensin receptor blockers, and pulmonary disease [19].

In our previous publication of the results of the ESC HF Pilot registry on Polish hospitalised patients, the only independent risk factors for in-hospital mortality were: higher heart rate at admission and lower natrium concentration at admission [8].

Despite advances in treatment, hospitalised HF patients remain at high risk for adverse outcomes, including mortality and high rate of HF readmissions. It shows that outpatient care may be insufficient and require improved cooperation between doctor and patient and management according to guidelines. Here an essential role is played by epidemiological data and registries that analyse real-life patients and assess risk factors. The ability to quantify an individual patient's risk is very important to make treatment decisions and discharge plans. Patients who are at higher risk may potentially benefit from closer follow-up and/or referral to HF disease management, heart transplantation evaluation, or evaluation for an LV assist device. Patients who are at lower risk could receive less intensive follow-up. Numerous risk assessment algorithms in HF have been developed; however, existing models only apply to outpatients or mortality before hospital discharge, or require invasive measures, thus limiting their usefulness [20–23].

### *Limitations of the study*

Some important limitations of the survey must be acknowledged. First, criteria for HF diagnosis were discussed during the investigator meetings, and the guidelines of reference were commented on and circulated to all investigators [24]. However, the investigators made the diagnoses according to clinical judgement. Secondly, even though we tried to balance the methodological need for consecutiveness of enrolment with the practical feasibility by increasing the workload for centres by limiting recruitment to one day per week for eight months, we cannot prove the consecutiveness of patient enrolment. Thirdly, the patients were all enrolled in cardiology wards and clinics, and they did not include those presenting at emergency departments and/or those admitted to other hospital facilities. Accordingly, the population reported herein does not represent all HF patients. Most of the patients included in the Polish cohort where hospitalised in clinical hospitals. This

may contribute to proceeding with patients, which is different to that of other countries. Finally, a formal committee did not adjudicate the ascertainment of cause of death.

## CONCLUSIONS

Patients discharged after hospitalisation for HF remained at high risk of death and hospital readmission. A previous history of coronary revascularisation, decreased renal function, and worse clinical status at admission with the need for inotropic support were predictors of one-year outcome in Polish patients hospitalised for HF.

Participating centres, investigators and data collection officers:

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## *References*


1. McMurray JJ, Adamopoulos S, Anker SD et al. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail, 2012; 14: 803–869. doi: 10.1093/eurheartj/ehs104.
2. Adams KF Jr, Fonarow GC, Emerman CL et al. Characteristics and outcomes of patients hospitalized for heart failure in the United States: rationale, design, and preliminary observations from the first 100,000 cases in the Acute Decompensated Heart Failure National Registry (ADHERE). Am Heart J, 2005; 149: 209–216. doi: 10.1016/j.ahj.2004.08.005.
3. Sato N, Kajimoto K, Asai K et al. Acute decompensated heart failure syndromes (ATTEND) registry. A prospective observational multicenter cohort study: rationale, design, and preliminary data. Am Heart J, 2010; 159: 949–955.e1. doi: 10.1016/j.ahj.2010.03.019.
4. Fonarow GC, Heywood JT, Heidenreich PA. et al. Temporal trends in clinical characteristics, treatments, and outcomes for heart failure hospitalizations, 2002 to 2004: findings from Acute Decompensated Heart Failure National Registry (ADHERE). Am Heart J, 2007; 153: 1021–1028. doi: 10.1016/j.ahj.2007.03.012.
5. Nieminen MS, Brutsaert D, Dickstein K et al. EuroHeart Failure Survey II (EHFS II): a survey on hospitalized acute heart failure patients: description of population. Eur Heart J, 2006; 27: 2725–2736. doi: 10.1093/eurheartj/ehl193.
6. Maggioni AP, Dahlstrom U, Filippatos G et al. EURObservational Research Programme: the Heart Failure Pilot Survey (ESC-HF Pilot). Eur J Heart Fail, 2010; 12: 1076–1084. doi: 10.1093/eurjhf/hfq154.
7. Maggioni AP, Dahlstrom U, Filippatos G et al. EURObservational Research Programme: regional differences and 1-year follow-up results of the Heart Failure Pilot Survey (ESC-HF Pilot). Eur J Heart Fail, 2013; 15: 808–817. doi: 10.1093/eurjhf/hft050.
8. Kaplon-Cieslicka A, Balsam P, Ozieranski K et al. Resting heart rate at hospital admission and its relation to hospital outcome in patients with heart failure. Cardiol J, 2014; 21: 425–433. doi: 10.5603/CJ.a2013.0147.
9. Sosnowska-Pasiarska B, Bartkowiak R, Wozakowska-Kaplon B et al. Population of Polish patients participating in the Heart Failure Pilot Survey (ESC-HF Pilot). Kardiol Pol, 2013; 71: 234–240. doi: 10.5603/KP.2013.0034.
10. Fonarow GC, Abraham WT, Albert NM et al. Age- and gender-related differences in quality of care and outcomes of patients hospitalized with heart failure (from OPTIMIZE-HF). Am J Cardiol, 2009; 104: 107–1015. doi: 10.1016/j.amjcard.2009.02.057.
11. Schaufelberger M, Swedberg K, Koster M et al. Decreasing one-year mortality and hospitalization rates for heart failure in Sweden; Data from the Swedish Hospital Discharge Registry 1988 to 2000. Eur Heart J, 2004; 25: 300–307. doi: 10.1016/j.ehj.2003.12.012.
12. Jhund PS, Macintyre K, Simpson CR et al. Long-term trends in first hospitalization for heart failure and subsequent survival between 1986 and 2003: a population study of 5.1 million people. Circulation, 2009; 119: 515–523. doi: 10.1161/CIRCULATIONAHA.108.812172.

13. McMurray JJ, Adamopoulos S, Anker SD et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: the Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. Eur Heart J, 2012; 33: 1787–1847. doi: 10.1093/eurheartj/ehs104.
14. Rudiger A, Harjola VP, Muller A et al. Acute heart failure: clinical presentation, one-year mortality and prognostic factors. Eur J Heart Fail, 2005; 7: 662–670. doi: 10.1016/j.ejheart.2005.01.014.
15. Zannad F, Mebazaa A, Juilliere Y et al. Clinical profile, contemporary management and one-year mortality in patients with severe acute heart failure syndromes: the EFICA study. Eur J Heart Fail, 2006; 8: 697–705. doi: 10.1016/j.ejheart.2006.01.001.
16. Abraham WT, Fonarow GC, Albert NM. et al. Predictors of in-hospital mortality in patients hospitalized for heart failure: insights from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). J Am Coll Cardiol, 2008; 52: 347–356. doi:10.1016/j.jacc.2008.04.028.
17. Tavazzi L, Maggioni AP, Lucci D et al. Nationwide survey on acute heart failure in cardiology ward services in Italy. Eur Heart J, 2006; 27: 1207–1215. doi: 10.1093/eurheartj/ehi845.
18. Choi DJ, Han S, Jeon ES et al. Characteristics, outcomes and predictors of long-term mortality for patients hospitalized for acute heart failure: a report from the korean heart failure registry. Korean Circ J, 2011; 41: 363–371. doi: 10.4070/kcj.2011.41.7.363.
19. O'Connor CM, Abraham WT, Albert NM. et al. Predictors of mortality after discharge in patients hospitalized with heart failure: an analysis from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). Am Heart J, 2008; 156: 662–673. doi: 10.1016/j.ahj.2008.04.030.
20. Lee DS, Austin PC, Rouleau JL at al. Predicting mortality among patients hospitalized for heart failure: derivation and validation of a clinical model. JAMA, 2003; 290: 2581–2587. doi: 10.1001/jama.290.19.2581.
21. Levy WC, Mozaffarian D, Linker DT et al. The Seattle Heart Failure Model: prediction of survival in heart failure. Circulation, 2006; 113: 1424–1433. doi: 10.1161/CIRCULATIONAHA.105.584102.
22. Pocock SJ, Wang D, Pfeffer MA et al. Predictors of mortality and morbidity in patients with chronic heart failure. Eur Heart J, 2006; 27: 65–75. doi: 10.1093/eurheartj/ehi555.
23. Fonarow GC, Adams KF, Abraham WT at al. Risk stratification for in-hospital mortality in acutely decompensated heart failure: classification and regression tree analysis. JAMA, 2005; 293: 572–580. doi:10.1001/jama.293.5.572.
24. Dickstein K, Cohen-Solal A, Filippatos G et al. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: the Task Force for the diagnosis and treatment of acute and chronic heart failure 2008 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association of the ESC (HFA) and endorsed by the European Society of Intensive Care Medicine (ESICM). Eur J Heart Fail, 2008; 10: 933–989. doi: 10.1093/eurheartj/ehn309.

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# Czynniki rokownicze w długoterminowej obserwacji pacjentów hospitalizowanych z powodu niewydolności serca: wyniki analizy polskiej części rejestru *Heart Failure Pilot Survey* Europejskiego Towarzystwa Kardiologicznego

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## Streszczenie

**Wstęp:** W ciągu ostatnich dekad pomimo postępów w zapobieganiu czynnikom ryzyka stale wzrasta częstość występowania przewlekłej niewydolności serca (HF), która staje się jednym z najistotniejszych wyzwań współczesnej medycyny. Jest to wynik wydłużenia życia i zwiększenia odsetka osób w podeszłym wieku w społeczeństwie, czyli populacji najbardziej narażonej na wystąpienie HF. Oczywistą rolę w tym zjawisku odgrywa także poprawa rokowania pacjentów z nadciśnieniem tętniczym i chorobą wieńcową, co prowadzi do zwiększonej liczby ocalonych osób z dysfunkcją lewej komory. Mimo wprowadzenia nowoczesnych metod terapeutycznych HF wiąże się z niekorzystnymi wynikami i wysokim odsetkiem powtórnych hospitalizacji.

**Cel:** Celem pracy była ocena czynników predykcyjnych rocznej śmiertelności i powtórnych hospitalizacji wśród pacjentów przyjętych z powodu HF.

**Metody:** Badaniem objęto pacjentów hospitalizowanych z powodu HF, którzy wyrazili zgodę na udział w polskiej części rejestru *Heart Failure Pilot Survey* Europejskiego Towarzystwa Kardiologicznego. Pierwotnym punktem końcowym był zgon z wszystkich przyczyn po okresie rocznej obserwacji, natomiast wtórny punkt końcowy obejmował zgon z wszystkich przyczyn oraz hospitalizacje z przyczyn sercowych po rocznej obserwacji. W wieloczynnikowej analizie regresji logistycznej uwzględniono wszystkie czynniki z wartością $p < 0,1$ uzyskane w analizach jednoczynnikowych. Za istotne statystyczne przyjęto wartości $p < 0,05$ dla wszystkich testów. Obliczenia statystyczne wykonano przy użyciu oprogramowania SAS w wersji 9.2.

**Wyniki:** Ostateczną analizą objęto 629 pacjentów. Dane dotyczące rocznego przeżycia były dostępne dla całej populacji, natomiast dane obejmujące rehospitalizacje uzyskano w 503 przypadkach. Pierwotny punkt końcowy wystąpił u 68 z 629 pacjentów (10,8%), którzy (w porównaniu z osobami, które przeżyły) byli starsi, ich historia medyczna częściej obejmowała migotanie przedsionków, chorobę niedokrwienną serca, angioplastykę tętnic wieńcowych (PCI) i pomostowanie aortalno-wieńcowe (CABG). Przy przyjęciu charakteryzował ich gorszy stan kliniczny (wyższa klasa *New York Heart Association* [NYHA]) i częściej wymagali leczenia aminami presyjnymi. Przy wypisaniu ze szpitala charakteryzowali się niższym ciśnieniem tętniczym oraz niższym wskaźnikiem przesączania kłębuszkowego (eGFR). Analiza wieloczynnikowa wykazała, że niezależnymi czynnikami zgonu w okresie roku były: wyższa klasa NYHA przy przyjęciu (OR 1,90; 95% CI 1,01–3,59; $p = 0,0478$), zastosowanie amin presyjnych podczas hospitalizacji (OR 3,96; 95% CI 1,49–10,47; $p = 0,0056$) oraz niższy eGFR przy wypisaniu ze szpitala (OR 0,978; 95% CI 0,961–0,995; $p = 0,0117$). Wtórny punkt końcowy wystąpił u 278 z 503 pacjentów (55,3%). Charakteryzowali się oni częstszą historią PCI/CABG i hospitalizacji z powodu HF, niższą frakcją wyrzutową lewej komory, wyższą klasą NYHA przy przyjęciu oraz częściej wymagali terapii aminami presyjnymi podczas hospitalizacji, a także zastosowania leków przeciwkrzepliwych i diuretyków przy wypisaniu ze szpitala. Analiza wieloczynnikowa wykazała, że niezależnymi czynnikami ryzyka wystąpienia wtórnego punktu końcowego były: historia PCI/CABG (OR 2,403; 95% CI 1,221–4,701; $p = 0,002$) oraz stosowanie amin presyjnych podczas hospitalizacji (OR 2,521; 95% CI 1,062–5,651; $p = 0,009$).

**Wnioski:** Pacjenci wypisani po hospitalizacji z powodu HF należą do grupy podwyższonego ryzyka zgonu i powtórnej hospitalizacji. Historia rewaskularyzacji wieńcowej, obniżona wartość GFR, gorszy stan kliniczny przy przyjęciu i konieczność stosowania amin presyjnych były długoterminowymi czynnikami rokowniczymi wśród osób hospitalizowanych z powodu HF.

**Słowa kluczowe:** niewydolność serca, hospitalizacja, aminy presyjne, rokowanie, rejestr

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