Annual prognostic factors in chronic heart failure in patients over 80 years old

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Abstract

Background: In the elderly the most common cause of hospitalisation and the leading cause of death is heart failure (HF).

Aim: The purpose was to determine prognostic factors in chronic HF (CHF) in octogenarians and nonagenarians.

Methods: The analysis included 197 consecutive patients over 80 years old (mean age 83.63 ± 3.01 years; 46.19% men) hospitalised in 2010–2013 due to CHF. Sixty-two parameters were investigated, such as: age, gender, New York Heart Association functional class, body mass index, blood pressure, other comorbidities, the parameters of the 12-lead resting electrocardiography and the echocardiography, the results of basic laboratory tests, and selected biomarkers, including N-terminal pro-B-type natriuretic peptide, high-sensitive troponin T (hs-TnT), and high-sensitive C-reactive protein. Participants remained in a prospective follow-up for 12 months. We defined the primary endpoint as death due to cardiovascular causes and the composite endpoint, which consisted of: death due to cardiovascular causes and/or hospitalisation for exacerbation of CHF. Follow-up concerning the deaths was performed in 189 patients, composite endpoint in 168 and hospitalisation in 166. The uni- and multivariate logistic regression stepwise analysis was performed for the entire population, according to left ventricular ejection fraction (LVEF < 45% and ≥ 45%) and in the group with glomerular filtration rate (GFR) < 60 mL/min.

Results: Patients who died constituted 11.1% of the study population (21/189). In multivariate analysis four variables were independently associated with the primary endpoint: GFR (OR = 0.92), hypertension (OR = 0.19), lung diseases (OR = 9.36), and vascular diseases (OR = 6.07). In turn, in the group of patients who reached the composite endpoint (55/168; 32.7%), the only statistically significant independent variable was anaemia (OR = 4.71). In the subpopulation of patients with LVEF < 45% the prognostics for each endpoint were vascular diseases and lung diseases, and they increased the risk from 10- to 24-fold. In the subgroup of patients with LVEF ≥ 45% the independent variable associated with the composite endpoint was haemoglobin (OR = 0.61), in turn for death the prognostics were: white blood cell count, hs-TnT, and vascular diseases (respectively OR = 1.30; OR = 1.04; OR = 3.96). In the population with GFR < 60 mL/min variables with prognostic importance for the composite endpoint were red blood cell parameters: red blood cell distribution width (OR = 1.42) and anaemia (OR = 3.79), while for occurrence of death they were the same as for the entire population — vascular (OR = 5.16) and lung diseases (OR = 4.72).

Conclusions: In patients over 80 years old with CHF, comorbidities are of important prognostic value for annual prognosis. The most aggravating factor in studied subgroups was lung disease.

Key words: chronic heart failure, elderly, prognosis

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INTRODUCTION

Advances in the diagnosis and treatment of civilisation diseases and effective primary and secondary prevention have resulted in a logarithmic increase in the elderly population.

The Central Statistical Office estimates that in 2035 the percentage of the oldest people in Poland at the age of over 80 years will double from 3.6% to 7.2% (www.stat.gov.pl).

In the elderly the most common cause of hospitalisation is heart failure (HF) [1, 2]. According to the Institute of Management in Health Care in Poland seniors over 80 years old represent 43.7% of patients hospitalised due to HF. Despite significant advances in cardiology, prognosis in HF is inauspicious and it is the leading cause of death in seniors. In the oldest people aged 80+ years with HF five-year survival is only 19% [3]. Therefore, it is necessary to search for prognostic factors in chronic HF (CHF) for patients representing the oldest age group — octogenarians and nonagenarians.

The main aim of this study was to determine the prognostic factors in CHF for 80+ seniors in identifying patients at highest risk of death due to cardiovascular causes and/or rehospitalisation for exacerbation of CHF in one-year observation.

METHODS

The analysis included 197 consecutive patients over 80 years old (mean age 83.63 ± 3.01 years; 46.19% men) hospitalised in 2010–2013 due to CHF. The patients were directed to the ward to perform a dipper examination as transoesophageal echocardiography and/or coronary angiography. Inclusion criteria were as follows: pre-existing CHF with signs and symptoms unchanging during at least one month with stable therapy, II to IV (ambulatory) New York Heart Association (NYHA) functional class, age ≥ 80 years, and optimal medical therapy according to the recommendations of the European Society of Cardiology (ESC) [4]. Exclusion criteria were: acute/unstable HF, acute coronary syndrome, valvular heart diseases (moderate or severe — to exclude patients requiring surgery, which would affect their prognosis), patients in limited verbal-logical contact, not obtaining written and informed consent to the study.

Sixty-two parameters were investigated, for example: age, gender, NYHA functional class, body mass index, blood pressure (BP), impaired glucose and lipid metabolism, the burden of other comorbidities (myocardial infarction, arterial hypertension [systolic BP ≥ 140 mm Hg and/or diastolic BP ≥ 90 mm Hg or using antihypertensive drugs — according to 2007 ESH/ESC guidelines recommendations], vascular disease (a history of stroke or transient ischaemic attack [TIA], carotid arteries stenosis, and peripheral artery occlusive disease), chronic anaemia (diagnosed according to the World Health Organisation [WHO] when the haemoglobin level was < 13 g/dL for men and < 12 g/dL for women), pulmonary disease (chronic obstructive pulmonary disease [COPD] or asthma, neoplasms) — based on previous medical files, the results of basic laboratory tests (creatinine, glomerular filtration rate [GFR] estimated by Cockcroft-Gault's model, glucose and lipid levels, blood count and selected biomarkers, including N-terminal pro-B-type natriuretic peptide [NT-proBNP], high-sensitive troponin T [hs-TnT], high-sensitive C-reactive protein [hs-CRP]), the parameters of the 12-lead resting electrocardiogram (heart rate > 70/min, atrial fibrillation/atrial flutter on admission to the ward, conduction abnormalities — atrioventricular and intraventricular heart block) and the results of echocardiography: left ventricular ejection fraction (LVEF) [%], LVEF < 45%, the left atrium/right atrium (LA/RA) longitudinal axis — the ratio of size of the LA to the size of the RA in the longitudinal line, the LA/RA short axis — the ratio of size of the LA to the size of the RA in short line, left ventricular end-diastolic volume, and left ventricular end-systolic volume.

Patient characteristics are shown in Table 1. Participants remained in a prospective follow-up for 12 months. The start of observation was the day of admission to the hospital. Using telephone contact with reading aloud or fax discharge summaries, we obtained information about the current NYHA functional class, current pharmacotherapy, and death due to cardiovascular causes during one year, which was the primary end point. We also defined in the study the composite end point, which consisted of death due to cardiovascular causes and/or hospitalisation for exacerbation of CHF. Moreover, an additional end point was hospitalisation due to exacerbation of CHF. Follow-up concerning the primary end point was performed in 189 patients, the composite endpoint in 168, and the hospitalisation in 166. The study was approved by the Bioethical Committee of the Medical University of Lodz (RNN/46/11/KE March 11th, 2011).

Statistical analysis

Calculations were performed using the statistical packages: STATISTICA PL 10 (StatSoft, Inc, USA), SPSS 21 (IBM SPSS Statistics, version 21, USA), rms, predictAbel and pROC. Quantitative variables were characterised using the basic descriptive statistics: number of observations (N), mean, median, minimum (Min), and maximum (Max) values, interquartile range (IQR), and standard deviation (SD), depending on the normality of distribution. Categorical variables were reported as the number of observations (N) and the corresponding percentage (%). Normality was tested using the Shapiro-Wilk's test for normality. To investigate whether relationships existed between qualitative variables the χ^2 test or χ^2 test with Yates' adjustment and Fisher's test were used. For quantitative variables, statistical analysis was based on Student's t test (if the variable distribution was normal in both groups) or Mann-Whitney's U test (for non-normally distributed variables).

For quantitative variables significantly associated with the annual prognosis, received operating characteristic (ROC) curves were drawn and decision thresholds were found. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated. Odds ratios (OR) with 95% confidence interval (CI) were also presented.

The variables statistically significant in univariate analysis were used in multivariate forward stepwise logistic regression

Table 1. Clinical characteristics of the studied population

Variables	
Studied population	197 (100%)
Age [years]	83 (80–95)
Male sex	91 (46%)
Hospitalisation [days]	5 (3–6)
NYHA class:	
II	81 (42%)
III	73 (37%)
IV (ambulatory)	43 (22%)
Ischaemic aetiology of CHF	146 (74%)
Non-ischaemic aetiology of CHF	51 (26%)
Hypertension	174 (88%)
Systolic BP [mm Hg]	130 (120–140)
Diastolic BP [mm Hg]	80 (70–80)
Body mass index [kg/m^2]	27 ± 4 (16–36)
Diabetes	68 (35%)
History of MI	68 (35%)
Vascular diseases*	42 (21%)
Chronic renal failure with GFR < 60 mL/min	109 (61%)
Lung diseases**	50 (25%)
Neoplasms	26 (13%)
Anaemia	65 (33%)
Number of drugs/person/day	7 (6–9)
Atrial fibrillation/flutter	65 (33%)
LVEF [%]	58 (46–64)
LVEF < 45%	47 (24%)
hs-TnT [ng/L]	21 (12–34)
hs-CRP [mg/L]	2 (1–9)
NT-proBNP [pg/mL]	960 (361–2528)

Data are expressed as N (%), mean ± standard deviation and ranges in normal distribution, median and interquartile ranges (IQR) in non--normal distribution. *Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis and peripheral artery disease; **Lung diseases: chronic obstructive pulmonary disease or asthma; BP — blood pressure; CHF — chronic heart failure; GFR — glomerular filtration rate; hs-TnT — high-sensitive troponin T; hs-CRP — high--sensitive C-reactive protein; LVEF — left ventricular ejection fraction; MI — myocardial infarction; NT-proBNP — N–terminal pro-B-type natriuretic peptide; NYHA — New York Heart Association

models. In this way we determined independent risk factors for the various end points. All tests were two-tailed, and p values < 0.05 were considered statistically significant.

The following analysis was performed: according to death, the composite end point and rehospitalisation due to worsening HF for the entire population and for the population with LVEF < 45%, LVEF ≥ 45% and GFR < 60 mL/min.

RESULTS

Patient characteristics are shown in Table 1. The study population of people over 80 years old was characterised by: a predominance of women, significantly reduced NYHA class — III/IV (ambulatory), comorbidities such as: hypertension, chronic coronary artery disease, atrial fibrillation, conduction disorders, vascular diseases (a history of stroke or TIA, carotid arteries stenosis and peripheral artery disease), chronic renal failure, anaemia, lung diseases, and neoplasms. Impaired left ventricular systolic function was reported in 1/4 of patients and abnormal diastolic function in 1/3 of patients. In addition, this population was characterised by common use of polypharmacy.

At discharge beta-blockers were used in 84.3% (166/197), angiotensin converting enzyme inhibitors (ACEI) in 55.3% (109/197), angiotensin receptor antagonists (ARB) in 26.4% (52/197), mineralocorticoid receptor antagonists (MRA) in 4.5% (9/197), diuretics in 64.5% (127/197), digoxin in 13.7% (27/197), and ivabradine was not used (hospitalisations in 2010–2013). Patients who died comprised 11.1% of the study population with telephone contact (21/189). Thirteen patients died due to exacerbation of CHF, five due to myocardial infarction, and three due to stroke. During one year of follow-up there were no deaths due to other comorbidities. Mortality during hospitalisation was observed in 14.3% (n = 3/21) of the patients who died. The clinical characteristics of patients stratified by the primary endpoint are shown in Table 2. Patients who died had higher concentration of hs-TnT, hs-CRP, NT-proBNP, white blood cell count (WBC), and creatinine, lower GFR, and lower diastolic BP. Among other analysed laboratory, electrocardiographic, and echocardiographic parameters there were no significant differences. Age was not a risk factor in the general population or in subgroups. However, we investigated a fairly narrow age range of patients: min 80, max 95 years.

In multivariate analysis four variables were independently associated with the primary end point: GFR, arterial hypertension, lung diseases, and vascular diseases (Table 3). Using ROC curve analysis a cutoff point value of GFR < 57.989 mL/min was determined as predictive. If the GFR level increased by one unit, the risk of death during the annual observation decreased by 8.3%.

The group of patients who reached the composite end point consisted of 55 people/168 (32.7%). In multivariate analysis, the only statistically significant independent variable for death and/or hospitalisation was anaemia (OR = 4.71; 95% CI 1.905–11.662; p = 0.001).

Among patients rehospitalised for exacerbation of HF (48/166; 28.9%), the variables associated with hospitalisation were GFR (OR = 0.97; 95% CI 0.954–0.994; p = 0.010) and lung diseases (OR = 2.45; 95% CI 1.109–5.404; p = 0.027). The cutoff point value from the ROC curve analysis for GFR was < 41.843 mL/min. If GFR increased by one unit, the risk of the hospitalisation decreased by 2.6%.

Table 2. Clinical characteristics of patients according to the primary and the composite endpoint

Variables	Without primary endpoint	Primary endpoint	p	Without composite endpoint	Composite endpoint	p
Age [years]	83 (80–95)	84 ± 3 (80–89)	0.43	83 (80–95)	84 (80–92)	0.09
Male sex	74 (44%)	14 (66%)	**0.049**	49 (43%)	30 (55%)	0.17
Hospitalisation [days]	5 (3–6)	5 (4–8)	0.25	4 (3–6)	5 (3–8)	**0.01**
NYHA class:						
II	74 (44%)	4 (19%)	**0.001**	54 (48%)	15 (28%)	**0.01**
III	65 (39%)	4 (19%)		43 (38%)	20 (36%)	
IV (ambulatory)	29 (17%)	13 (62%)		16 (14%)	20 (36%)	
Hypertension	153 (91%)	15 (71%)	**0.02**	100 (89%)	46 (84%)	0.39
Systolic BP [mm Hg]	130 (120–140)	127 ± 20 (90–170)	0.17	130 (120–140)	132 ± 21 (90–190)	0.47
Diastolic BP [mm Hg]	80 (70–80)	71 ± 11 (50–90)	**0.03**	80 (70–80)	78 (70–80)	0.33
Body mass index [kg/m^2]	27 ± 4 (16–36)	26 ± 4 (18–33)	0.78	27 ± 4 (19–36)	26 ± 4 (16–36)	0.20
Diabetes	59 (35%)	6 (29%)	0.55	41 (36%)	16 (29%)	0.36
Chronic coronary disease	120 (71%)	19 (91%)	0.11	83 (74%)	41 (75%)	0.88
History of MI	57 (34%)	9 (43%)	0.42	34 (31%)	20 (36%)	0.41
History of PCI/POBA	47 (28%)	9 (43%)	0.17	30 (27%)	19 (35%)	0.29
History of CABG	16 (10%)	3 (14%)	0.77	11 (10%)	4 (7%)	0.81
Vascular diseases*	29 (17%)	12 (57%)	**0.0001**	19 (17%)	20 (36%)	**0.01**
Non-cardiovascular diseases	138 (82%)	18 (86%)	0.92	89 (79%)	50 (91%)	0.08
Lung diseases**	36 (21%)	13 (62%)	**0.0002**	20 (18%)	23 (42%)	**0.001**
Neoplasms	20 (12%)	5 (24%)	0.24	10 (9%)	12 (22%)	**0.02**
Anaemia	54 (32%)	8 (38%)	0.59	28 (25%)	25 (46%)	**0.01**
Number of drugs/person/day	7 (6–9)	8 (7–9)	0.48	7 (6–9)	7 (6–9)	0.30

Data are expressed as N (%), mean ± standard deviation and ranges in normal distribution, median and interquartile ranges in non-normal distribution.
*Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis, and peripheral artery disease; **Lung diseases: chronic obstructive pulmonary disease or asthma; BP — blood pressure; CABG — coronary artery bypass graft; MI — myocardial infarction; NYHA — New York Heart Association; PCI — percutaneous coronary intervention; POBA — percutaneous old balloon angioplasty

Table 3. Results of multivariate analysis for the primary endpoint in the entire population

Variables	B	SE	p	OR	95% CI for OR	
GFR [1 unit]	–0.09	0.03	**0.001**	0.92	0.87	0.96
Hypertension*	–1.65	0.79	**0.04**	0.19	0.04	0.92
Vascular diseases**	1.80	0.64	**0.01**	6.07	1.72	21.43
Lung diseases***	2.24	0.65	**0.001**	9.36	2.64	33.16
Intercept	1.99	1.35	0.14	×	×	×

*Hypertension: systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg or using antihypertensive drugs; **Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis, and peripheral artery disease; ***Lung diseases: chronic obstructive pulmonary disease or asthma; CI — confidence interval; GFR — glomerular filtration rate; OR — odds ratio; SE — standard error

In patients with LVEF < 45% the prognostic factors for adverse cardiac events were more homogeneous (Table 4). For each end point vascular and lung diseases turned out to be prognostic (OR range from 9.89 to 24.38). An additional prognostic variable for annual death was arterial hypertension, which reduced the risk by 92% (Table 4).

In patients with LVEF ≥ 45% the independent variable associated with the composite end point and rehospitalisation was haemoglobin (Hb). If the concentration of Hb increased by one unit, the risk of the composite end point decreased by 39% and the risk of the hospitalisation by 27.2%. In turn, for annual death the prognostics were: WBC, hs-TnT, and vascular diseases (Table 5).

Table 4. Results of multivariate analysis for endpoints in the population with left ventricular ejection fraction < 45%

Variables	B	SE	p	OR	95% CI for OR	
Primary endpoint						
Hypertension*	−2.53	1.29	0.01	0.08	0.01	1.00
Vascular diseases**	2.53	1.29	0.01	12.57	0.99	158.16
Lung diseases***	3.12	1.38	0.01	22.75	1.53	339.32
Intercept	−1.98	1.33	0.02	×	×	×
Composite endpoint						
Vascular diseases**	3.10	1.31	0.02	22.23	1.69	292.01
Lung diseases***	3.11	1.2	0.01	22.40	1.97	254.51
Intercept	−1.24	0.68	0.07	×	×	×
Hospitalisations						
Vascular diseases**	3.19	1.30	0.01	24.38	1.89	313.41
Lung diseases***	2.29	1.03	0.03	9.89	1.32	73.97
Intercept	−1.28	0.68	0.06	×	×	×

*Hypertension: systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg or using antihypertensive drugs; **Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis, and peripheral artery disease; ***Lung diseases: chronic obstructive pulmonary disease or asthma; CI — confidence interval; OR — odds ratio; SE — standard error

Table 5. Results of multivariate analysis for endpoints in the population with left ventricular ejection fraction ≥ 45%

Variables	B	SE	p	OR	95% CI for OR	
Primary endpoint						
hs-TnT [1 unit]	0.03	0.02	0.001	1.04	1.01	1.07
WBC [1 unit]	0.27	0.12	0.01	1.30	1.03	1.64
Vascular diseases*	1.38	0.76	0.04	3.96	0.89	17.71
Intercept	−6.28	1.32	0.001	×	×	×
Composite endpoint						
Haemoglobin [1 unit]	−0.49	0.18	0.01	0.61	0.43	0.87
Intercept	5.49	2.34	0.02	×	×	×
Hospitalisations						
Haemoglobin [1 unit]	−0.30	0.14	0.03	0.74	0.56	0.97
Intercept	2.99	1.86	0.11	×	×	×

*Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis, and peripheral artery disease; CI — confidence interval; hs-TnT — high-sensitive troponin T; OR — odds ratio; WBC — white blood cell count; SE — standard error

Similarly, in the population with GFR < 60 mL/min, variables with prognostic importance for the composite end point and rehospitalisation were red blood cell parameters: red blood cell distribution width (RDW) and anaemia (Table 6). Whereas for cardiovascular death the prognostics were the same two variables as for entire population: vascular and lung diseases (Table 6).

DISCUSSION

We identified the following prognostic factors for patients over 80 years old with CHF: vascular and lung disease, arterial hypertension, red blood cell parameters, and GFR. To our knowledge, it is the biggest Polish study of the annual prognosis in 80+ seniors with CHF.

In the studied population, both vascular and lung disease were common (respectively, 21.3% and 25.4%). In the analysis by Matusik et al. [5] in the POLKARD Project — National Project of Prevention and Treatment of Cardiovascular Disease — pulmonary disorders (COPD and asthma) occurred in octogenarians with CHF in a similar percentage: 25.3%. Overall, it is estimated that lung diseases burden CHF in 20––35% [6] of cases and frequently lead to exacerbations of CHF, resignation of beta-blockers, and/or not reaching the target dose [4] and worsening the prognosis. On the basis of a large

Table 6. Results of multivariate analysis for endpoints in population with glomerular filtration rate < 60 mL/min

Variables	B	SE	p	OR	95% CI for OR	
Primary endpoint						
Vascular diseases*	1.64	0.65	**0.01**	5.16	1.44	18.48
Lung diseases**	1.55	0.64	**0.02**	4.72	1.35	16.48
Intercept	–3.48	0.62	**0.00**	×	×	×
Composite endpoint						
RDW [1 unit]	0.35	0.18	**0.05**	1.42	0.99	2.01
Intercept	–5.79	2.49	**0.02**	×	×	×
Hospitalisations						
Anaemia***	1.33	0.56	**0.02**	3.79	1.26	11.42
Intercept	–1.67	0.45	**0.00**	×	×	×

*Vascular diseases: a history of stroke or transient ischaemic attack, carotid arteries stenosis, and peripheral artery disease; **Lung diseases: chronic obstructive pulmonary disease or asthma; ***Anaemia: the haemoglobin level was < 13 g/dL for men and <12 g/dL for women; CI — confidence interval; OR — odds ratio; RDW — red blood cell distribution width; SE — standard error

Norwegian registry of 4132 patients with HF from 22 hospitals, De Blois et al. [7] documented that COPD is a predictor of all-cause mortality in 13.3 months of follow-up (hazard ratio [HR] = 1.19; 95% CI 1.015–1.391; p = 0.03). Similarly, in the SHIFT study the risk of death due to cardiovascular causes, as well as the risk of rehospitalisation for worsening CHF in the 23-month follow-up, was significantly higher in patients with COPD (respectively, HR = 1.22; p = 0.006 and HR = 1.34; p < 0.001) [8]. In our study, respiratory disorders in seniors with CHF were reported to be the variable vastly aggravating annual prognosis — in the entire population it increased risk of death (OR = 9.36) and in patients with LVEF < 45% of each endpoint from 12- to 24-fold.

In turn, vascular diseases occurred in the POLKARD population [5] less frequently (14.5%) than in our study, but as well as stroke and TIA we included carotid arteries stenosis and peripheral artery disease to vascular diseases. The presence of vascular disease in octogenarians and nonagenarians turned out to be an important prognostic factor for annual mortality in every subgroup (HR range: 3.96–12.57) and for hospitalisation due to exacerbation of CHF in population with LVEF < 45% (HR = 24.38). Unfortunately, in the current literature there is a lack of studies evaluating the prognostic importance of vascular disease in the oldest populations with CHF. Only in 580 younger patients with CHF (mean age 63 ± 13 years) Kozdağ et al. [9] revealed in 1–6.5 years of observation that a history of stroke was the only independent predictor of both cardiovascular mortality (HR = 2.48; 95% CI 1.14–5.37; p = 0.022) and hospitalisation due to CHF (HR = 2.41; 95% CI 1.15–5.05; p = 0.019).

Other variables that had predictive value in this study were red blood cell parameters: anaemia, Hb, and RDW. Compared with other predictors that were obtained, red blood cell parameters had especially high prognostic value for hospitalisation or the composite end point. It was suggested that the increased RDW can predict the occurrence of death in CHF independently of BNP or NT-proBNP, particularly in the elderly [10]. However, this parameter is influenced by many different factors such as liver and kidney diseases, infections, blood transfusions, thrombotic disorders, or alcohol abuse. In the literature there are many reports showing the negative predictive significance of anaemia, but in younger populations with CHF [11, 12]. There is much less research on the prognostic importance of anaemia in the oldest patients. However, anaemia in the elderly often occurs and worsens the prognosis in CHF. Most frequently it is the result of chronic renal failure, cardio-renal syndrome, haemodilution, haematopoietic insufficiency deteriorating with age, nutritional deficiencies, inflammatory diseases, and iatrogenic due to anticoagulation and haemorrhagic complications. In the analysis of Russian scientists, in 164 elderly patients with CHF (60–85 years old) anaemia was seen as often as in our study — in 32.9% [13]. The criteria for diagnosis of anaemia were the same (according to the WHO), but they assessed ambulatory patients and the follow-up was longer at 1.0-4.75 years. The mortality was similar in patients with anaemia and without anaemia (27.8% vs. 30%; p = 0.768). However, in patients with cardio-renal anaemic syndrome, the survival rate was significantly lower compared to patients without anaemia and kidney disease (p = 0.004).

Another independent variable in cardiovascular risk stratification in this study was arterial hypertension. The coexistence of this disease had a protective effect and reduced the risk of death by 80.7% in the entire population (OR = 0.19) and by 92% in patients with LVEF < 45% (OR = 0.08) in multivariate analysis. There is no doubt that hypertension, also in the elderly, is an independent predictor of mortality in CHF and leads to progression of CHF [14]. However, in the oldest seniors, often with the frailty syndrome, orthostatic hypotension and autonomic neuropathy antihypertensive therapy requires

high prudence. In none of the randomised clinical trials that documented the positive effect of antihypertensive therapy on reducing cardiovascular mortality in the elderly was the average achieved systolic BP less than < 140 mm Hg [15, 16]. Typically, the trials enrolled patients in quite good physical and mental condition without a lot of comorbidities and orthostatic hypotension. In fact, such patients are a minority in daily practice. Moreover, the studies of theJapanese scientists JATOS [17] and Ogihara et al. [18] in seniors over 65 and 70 years old, which compared more and less intensive antihypertensive strategy, did not confirm the benefits in reduction of systolic BP < 140 mm Hg compared to < 160 mm Hg and < 150 mm Hg. The recommendations for the management of hypertension recommend reduction of BP to 140–150 mm Hg in 80+ patients with systolic BP ≥ 160 mm Hg, only if the patient is in good physical and mental condition (class I, level of evidence B) [15, 19].

In our study, patients who died were characterised by lower values of diastolic BP (from the univariate analysis p = 0.03). For systolic BP we did not reveal statistically significant differences. Without a doubt, a low BP is in fact a negative prognostic factor among patients with CHF. Even in the younger population without many comorbidities in the ARIC study (the Atherosclerosis Risk in Communities Study) orthostatic hypotension increased mortality risk more than two-fold during 13 years of follow-up [20].

The last factor useful in stratifying the risk of cardiovascular death and hospitalisation due to worsening CHF for 80+ seniors was GFR. At the initial stage of our research in 141 patients with CHF we did not reveal a statistically significant relationship between chronic kidney disease, defined as a GFR < 60 mL/min, and the risk of death during one year of follow-up [21]. However, the annual mortality was higher (16.1%) if the GFR was < 60 and even higher (21.4%) if the GFR was < 30 compared to preserved renal function (14.2%). The relationship between death and GFR was not statistically significant (for GFR < 60, p = 0.505; for GFR < 30, p = 0.547).

In turn in the study by Mogensen et al. [22] with 825 patients at age > 85 years, with CHF involved in two large clinical trials: DIAMOND (the Danish Investigations of Arrhythmia and Mortality on Dofetilide-Congestive HF) and ECHOES (the Echocardiography and Outcome Study) renal failure was a significant predictor, identifying the group at risk of death in the long-term follow-up of six to eight years (HR = 1.36; p < 0.0001). Also in the subgroup of patients > 80 years old with CHF in Forman's et al. study [23], worsening of renal function defined as a rise in serum creatinine of > 0.3 mg/dL was associated with higher risk of early intra-hospital death (adjusted risk ratio [ARR] = 7.5; 95% CI 2.9–19.3), complications (ARR = 2.1; 95% CI 1.5–3.0), and longer length of stay (ARR = 3.2; 95% CI 2.2–4.9).

Identification of patients at highest cardiovascular risk is crucial in cardiology, both for individual patients as well as for the entire healthcare system. There are many variables that have a high predictive significance for cardiac events in CHF. In seniors they are comorbidities such as anaemia and vascular, pulmonary, and kidney diseases. Despite their prognostic importance, occurrence of these diseases is crucial in the choice of therapeutic methods for seniors. Management of comorbidities is a key component of the holistic care of patients with CHF and usually requires involvement of multidisciplinary teams, especially in this age group.

Cardiovascular mortality in the study population was relatively low compared to the available research based on large populations. In our study it was 11.1% of patients. In the SENIORS study mortality from cardiovascular causes was 13.7%, but in the nebivolol group it was 11.5%. However, the average follow-up period was longer — 21 months, and the average age of the patients was lower — 76 ± 5 years [24].

While 17% of patients with LVEF < 45% died (n = 8/47), in the population with LVEF ≥ 45% it was only 8.2% (n = 12/147). This correlates with the results of other authors. Heart failure with preserved left ventricular systolic function (HF-PEF), which affects as many as 50% of patients over 80 years old with CHF (in our work — 74.6%, n = 147), is associated with better survival [25]. In the Framingham study, HF-PEF was characterised by an annual mortality of 8.7%, whereas in HF-REF it was 18.9% [26].

In turn, the occurrence of composite endpoint in our studied geriatric population (32.7%) was quite low compared to Polish patients from the Heart Failure Pilot Survey of the European Society of Cardiology (55.3%) [27]. However, in our study the composite endpoint consisted only of death due to cardiovascular causes and/or hospitalisation for exacerbation of CHF, while the composite endpoint in Balsam's et al. [27] work was composed of all-cause death and/or readmission for cardiac causes. Additionally, in our study the median ejection fraction was much higher at 58% (IQR = 46–64) than in the Heart Failure Pilot Survey — 37% (IQR = 27–50). Therefore, these populations are not comparable.

Limitations of the study

An important limitation of this study is the relatively small number of participants with primary end points. Additionally, follow-up was carried out using telephone contact without direct clinical assessment of the patients. Unfortunately, we had no information about the time since the hospitalisation to the endpoints. Therefore, it was not possible to estimate the parameters of Cox regression models, and thus we could not count the hazard ratio, but the only odds ratio. Moreover, we assessed only a few basic echocardiographic parameters. The reason for not analysing variables such as the volume of the atria and the diastolic function of the left ventricle was the small number of subpopulations with this measurement.

Therefore, we evaluated the LA/RA longitudinal axis and LA/RA short axis.

Moreover, we did not analyse the adherence score to guideline recommendations for treatment because of not reaching the target dose in elderly patients due to side effects, and we had no such initial assumptions. However, patients were treated with optimal medical therapy according to the ESC recommendations (three groups of drugs: ACE/ARBs, beta-blockers, MRAs) unless contraindicated or intolerant.

Another limitation of this study was the lack of a control group. However, the formation of a control group of healthy octogenarians and nonagenarians without CHF is an extremely difficult task. Finally, it was a hospital-based, short-term study. Therefore, outpatients with CHF were not included. Further multicentre investigations could provide more information about prognostic factors in the oldest patients with CHF.

Despite these limitations, it should be emphasised that this work has brought important (and new to the current state of the knowledge) information about risk stratification in patients over 80 years old with CHF.

CONCLUSIONS

In octogenarians and nonagenarians with CHF, comorbidities have important prognostic value for annual prognosis. They were: vascular, pulmonary, and kidney diseases, anaemia, and hypertension. The most aggravating factors were lung disorders.

Conflict of interest: *none declared*

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XXIII ŁÓDZKA KONFERENCJA KARDIOLOGICZNA odbędzie się **11 marca 2017 r. w Łodzi,** w Auli 1000 Centrum Dydaktycznego Uniwersytetu Medycznego (ul. Pomorska 251), w godzinach 9.00–16.00. Organizatorem jest Katedra Kardiologii Uniwersytetu Medycznego w Łodzi.

Do udziału zapraszamy lekarzy kardiologów, pielęgniarki, techników i ratowników medycznych, a także studentów, doktorantów oraz stażystów. Obowiązuje rejestracja za pomocą formularza elektronicznego dostępnego na stronie: www.lkk.umed.pl.

Atrakcyjność tegorocznego programu zwiększa odbywające się równolegle IX Forum Kardiologii Obrazowej — konferencja szkoleniowa o statusie szkolenia akredytacyjnego Sekcji Echokardiografii Polskiego Towarzystwa Kardiologicznego — szczegóły dostępne pod adresem: www.forumkardiologii.umed.pl.

Czynniki prognostyczne w obserwacji rocznej w przewlekłej niewydolności serca u chorych po 80. roku życia

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Streszczenie

Wstęp: U osób w wieku podeszłym najczęstszą przyczyną hospitalizacji i główną przyczyną zgonu jest niewydolność serca (HF).

Cel: Celem pracy było określenie czynników prognostycznych w przewlekłej HF dla 80-latków i 90-latków.

Metody: Analizą objęto 197 kolejnych pacjentów powyżej 80. rż. (średni wiek wynosił 83,63 ± 3,01 roku; 46,19% mężczyzn) hospitalizowanych w latach 2010–2013 z powodu przewlekłej HF. Analizowano 62 parametry, m.in.: wiek, płeć, klasę funkcjonalną wg *New York Heart Association*, wskaźnik masy ciała, ciśnienie tętnicze krwi, obciążenia innymi chorobami współistniejącymi, parametry z 12-odprowadzeniowego spoczynkowego zapisu elektrokardiograficznego oraz echokardiografii, a także wyniki podstawowych badań laboratoryjnych i wybrane biomarkery, w tym N-końcowy propeptyd natriuretyczny typu B, wysokoczułą troponinę T (hs-TnT), wysokoczułe białko C-reaktywne. Pacjenci byli objęci obserwacją prospektywną przez rok. Wyznaczono pierwszorzędowy punkt końcowy — zgon z przyczyn sercowo-naczyniowych oraz złożony punkt końcowy, na który składał się zgon z przyczyn sercowo-naczyniowych i/lub hospitalizacja związana z zaostrzeniem przewlekłej HF. Informacje o pierwszorzędowym punkcie końcowym udało się uzyskać od 189 osób, o złożonym punkcie końcowym — od 168, a o hospitalizacjach — od 166 chorych. Przeprowadzono jedno- i wieloczynnikową analizę metodą regresji logistycznej krokowej postępującej dla całej populacji, w zależności od frakcji wyrzutowej lewej komory (LVEF < 45% i ≥ 45%), oraz w grupie z współczynnikiem filtracji kłębuszkowej (GFR) < 60 ml/min.

Wyniki: Chorzy, którzy zmarli, stanowili 11,1% badanej populacji (21/189). Z analizy wieloczynnikowej uzyskano 4 zmienne niezależnie powiązane z wystąpieniem pierwszorzędowego punktu końcowego: GFR (OR = 0,92), nadciśnienie tętnicze (OR = 0,19), choroby płuc (OR = 9,36) i choroby naczyniowe (OR = 6,07). Wśród pacjentów, u których wystąpił złożony punkt końcowy (55/168; 32,7%), jedyną istotną statystycznie zmienną niezależną okazała się niedokrwistość (OR = 4,71). U osób z obniżoną LVEF < 45% dla każdego punktu końcowego prognostyczne okazały się choroby naczyniowe i choroby płuc, które zwiększały ryzyko od 10- do 24-krotnie. W podgrupie pacjentów z zachowaną LVEF ≥ 45% niezależną zmienną powiązaną z wystąpieniem złożonego punktu końcowego okazała się hemoglobina (OR = 0,61), natomiast dla wystąpienia zgonu prognostyczne były: liczba krwinek białych, hs-TnT i choroby naczyniowe (odpowiednio OR = 1,30; OR = 1,04 i OR = 3,96). W populacji z GFR < 60 ml/min zmiennymi mającymi znaczenie prognostyczne dla wystąpienia złożonego punktu końcowego były parametry czerwonokrwinkowe: wskaźnik zmienności objętości krwinek czerwonych (OR = 1,42) i niedokrwistość (OR = 3,79), natomiast dla wystąpienia zgonu, podobnie jak dla całej populacji, choroby naczyniowe (OR = 5,16) i choroby płuc (OR = 4,72).

Wnioski: W populacji pacjentów po 80. rż. z przewlekłą HF choroby współistniejące miały istotne znaczenie prognostyczne dla rocznego rokowania. W badanym materiale czynnikiem najbardziej obciążającym były choroby płuc.

Słowa kluczowe: przewlekła niewydolność serca, wiek starszy, rokowanie

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