Characteristics and management of acute heart failure patients in a single university hospital center

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Key words: *acute heart failure; chronic decompensated heart failure; pulmonary edema; cardiogenic shock; right heart failure.*

Summary. *Objective. To evaluate the causes of acute heart failure, complications, management, and outcomes.*

Material and methods. A total of 200 patients with diagnosed de novo acute heart failure (27.5%) or worsening chronic heart failure (72.5%) were treated at the Department of Cardiology, Hospital of Kaunas University of Medicine, which was participating in the Euro Heart Failure Survey-II (EHFS-II).

The patients were divided into five groups: 1) chronic decompensated heart failure (66.0%); 2) pulmonary edema (13.0%); 3) hypertensive heart failure (7.5%); 4) cardiogenic shock (11.0%); and 5) right heart failure (2.5%).

Results. Hypertensive and coronary heart diseases were the most common underlying conditions of acute heart failure. Noncompliance with the prescribed medications was present as the most frequent precipitating factor in more than half of the cases. Left ventricular ejection fraction of >45% was found in 28.64% of cases. Intravenous diuretics (74.5%), nitrates (44.0%), and heparin (71.0%) were the most widely used in the acute phase. At discharge from hospital, 96.69% of patients were given diuretics; 80.11%, angiotensin-converting enzyme inhibitors; and 62.43%, beta-blockers. The mean duration of inhospital stay was 13 days; death rate was 9.5%: after 3 months and 12 months, it was 7.5% and 11.5%, respectively.

Conclusion. Preserved systolic function, multiple concomitant diseases, and high mortality rates were observed in a substantial proportion of the patients hospitalized due to acute heart failure. The management of the patients in a university hospital center was performed in accordance with the international guidelines.

Introduction

Heart failure (HF) is a significant and growing problem in Europe with a prevalence of ~4–2% (1, 2). Acute heart failure (AHF) is one of the most common syndromes in cardiology associated with prolonged and frequent hospitalizations, decreased life expectancy and quality of life, high health care costs, poor prognosis, significant morbidity, and high mortality. Characteristics, clinical presentation, treatment, and outcomes of HF patients in the acute decompensated phase have not been adequately described, in part because a clear definition of AHF has been lacking (3). The European Society of Cardiology guidelines on acute heart failure (2005) focus on stratifying the definition of it: AHF is "a rapid onset of symptoms and signs secondary to abnormal cardiac function, with descriptive sub-definition stating that it is often life threatening and requires urgent treatment" (4). Diagnosis of AHF is based on HF symptoms and clinical signs, laboratory and instrumental investigations: ECG, chest x-ray, biochemical blood tests, echocardiography.

Even if the prevalence of symptomatic HF still ranges from 0.4 to 2.0% in general European population (2) and the incidence of HF is increasing, AHF has never been an objective of clinical studies in Lithuania before.

Methods

The Department of Cardiology at the Hospital of Kaunas University of Medicine (HKUM) was participating in the Euro Heart Failure Survey II (EHFS II)

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together with the other 133 cardiological centers (hospitals and private clinics) in 30 European countries from October 21, 2004, until August 31, 2005. Patient eligibility was based on diagnosed AHF. The data were collected from 200 patients admitted to the HKUM due to AHF.

All the patients were allocated to five clinical groups according to the European Society of Cardiology guidelines on the diagnosis and treatment of AHF (2005): 1) patients with chronic decompensated HF (66.0%); 2) patients with pulmonary edema (13.0%); 3) patients with HF due to hypertension (7.5%); 4) patients with cardiogenic shock (11.0%); and 5) patients with right HF (2.5%).

The inclusion was performed in accordance with the following criteria:

1) Acute decompensated heart failure (de novo or as decompensation of chronic heart failure) with signs and symptoms of AHF, which were mild and did not satisfy criteria of cardiogenic shock, pulmonary edema, or hypertensive crisis.
2) Hypertensive AHF: signs and symptoms of HF accompanied by high blood pressure (>180/100 mm Hg), relatively preserved left ventricular ejection fraction (LVEF), and signs of pulmonary congestion on chest x-ray.
3) Pulmonary edema (verified by chest x-ray) accompanied by severe respiratory distress, with crackles over the lung and orthopnea, with O_2 saturation usually <90% in ambient room air prior to a treatment.
4) Cardiogenic shock: cardiogenic shock defined as evidence of end-organ tissue hypoperfusion induced by HF. Cardiogenic shock usually characterized by reduced blood pressure (systolic BP <90 mm Hg or a drop in the mean arterial pressure >30 mm Hg for >30 min) and/or low urine output (<0.5 mL/kg/h), with a pulse rate of >60 bpm with or without evidence of organ congestion.
5) Right HF characterized by increased jugular venous pressure, increased liver size, and hypotension with or without left HF (4).

Etiology, precipitating factors, clinical presentation, diagnosis, and management were assessed. Outcomes were evaluated by the phone calls according to the registry questionnaire on the following 3 months after discharge from the hospital and also after the period of 12 months. All the data were collected on electronic case report form by login on the Euro Heart Survey website (www.euroheartsurvey.org). After the closing of database, single center data were opened for analysis.

Baseline characteristics of the study patients

The major part of all the participants (72.5%) were assigned to acute decompensated chronic heart failure (ADCHF) group. Patients in this group were older (mean age, 67.15±12.5 years), and 65% of all the studied patients were male (Table 1). The rest of the patients were assigned to the de novo AHF group. The most common underlying disease in both the groups was arterial hypertension (68.97% in the ADCHF and 74.55% in the de novo AHF groups). Coronary heart disease (CHD) was the second most common underlying disease (57% of all the cases), in the same proportion in both the study groups. Anemia was present in 55.5% of all the cases, more frequently in the ADCHF group than in the de novo AHF group (67.59% and 23.64%, respectively; $P<0.001$). Valvular heart disease was defined for one-third of the study participants. Atrial fibrillation or flutter was more frequent in the ADCHF group. Diabetes mellitus, as a concomitant disease, was diagnosed for the same proportion in both the study groups. Such concomitant disorders and factors as chronic obstructive pulmonary disease, renal failure, dilated cardiomyopathy, and implanted pacemaker were more frequent in the ADCHF group.

Precipitating factors for acute heart failure hospitalization

There were marked differences in precipitating factors between the study groups (Table 2). Noncompliance with or reduction in medication therapy was the major precipitating factors in both the groups, but it was more frequent in patients with ADCHF than in the de novo AHF group (67.59% vs. 27.27%, respectively; $P<0.001$). Valvular heart disorders were found in half of the studied patients, and it was more frequent in the ADCHF group (58.62% vs. 23.73%, respectively; $P<0.001$). Arrhythmia, as a precipitating factor for HF, was present in 41% of cases; there was no difference between the study groups in this aspect. Acute coronary syndromes were responsible for de novo AHF in 76.36% of cases and less frequently for ADCHF (15.17%) ($P<0.001$). Infection was registered just in 15% of patients, and both the study groups did not differ in this aspect.

Baseline characteristics and underlying diseases by clinical classification

Of all the patients, 66% were described as a decompensated HF class. Pulmonary edema was present in 13% and cardiogenic shock in 11% of the patients (Table 3). Hypertensive HF and right HF were present in 7.5% and 2.5% of the patients, respectively.

***Table 1*. Underlying and concomitant diseases of patients with acute heart failure**

Characteristic	Total		ADCHF		De novo AHF		*P* value
	N	%	N	%	N	%	
Number	200	100.00	145	72.50	55	27.50	
Age, mean (SD)	66.92 (12.5)		67.15 (12.5)		66.31 (12.5)		
Male	130	65.00	90	62.07	40	72.73	>0.05
Underlying diseases							
Hypertension	141	70.50	100	68.97	41	74.55	>0.05
CHD	114	57.00	87	60.00	27	49.01	>0.05
Valvular disease	65	32.50	47	32.41	18	32.73	>0.05
Dilated cardiomyopathy	14	7.00	14	9.66	0	0.00	<0.001
Concomitant diseases							
Anemia	111	55.50	98	67.59	13	23.64	<0.001
Atrial fibrillation/flutter	104	52.00	87	60.00	17	30.91	<0.001
Diabetes mellitus	36	18.00	26	17.93	10	18.18	>0.05
Previous stroke or TIA	29	14.50	24	16.55	5	9.09	>0.05
Chronic obstructive pulmonary disease	18	9.00	16	11.03	2	3.64	<0.05
Renal failure	17	8.50	14	9.66	3	5.45	>0.05
Pacemaker implanted	16	8.00	10	6.90	6	10.91	>0.05

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; CHD – coronary heart disease; TIA – transient ischemic attack.

***Table 2*. Precipitating factors of patients with acute heart failure**

Characteristic	Total		ADCHF		De novo AHF		*P* value
	N	%	N	%	N	%	
Number	200	100.00	145	72.50	55	27.50	
Age, mean (SD)	66.92 (12.5)		67.15 (12.5)		66.31 (12.5)		
Male	130	65.00	90	62.07	40	72.73	>0.05
Precipitating factors (on admission)							
Noncompliance with therapy	113	56.50	98	67.59	15	27.27	<0.001
Valvular cause	98	49.00	85	58.62	13	23.73	<0.001
Arrhythmia	82	41.00	64	44.14	18	32.73	>0.05
ACS	64	32.00	22	15.17	42	76.36	<0.001
STEMI	43	21.50	11	7.59	32	58.18	<0.001
Non-STEMI	12	6.00	7	4.83	5	9.09	>0.05
Unstable angina	9	4.50	4	2.76	5	9.09	>0.05
Infection	30	15.00	19	13.10	11	20.00	>0.05

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; ACS – acute coronary syndromes; STEMI – ST-elevation myocardial infarction; non-STEMI – without ST-elevation myocardial infarction.

Hypertensive heart disease as underlying disease was prevalent in all clinical classes (Table 3).

Except hypertension, other most common clinical conditions and underlying disorders in the patients with decompensated HF class were anemia (67.42%), CHD (58.33%) and atrial fibrillation or flutter (57.58%). Similar distribution was observed in the patients with pulmonary edema and cardiogenic shock, but the above-mentioned underlying disorders were more frequent in pulmonary edema class. In hypertensive HF group, anemia was diagnosed only in 26.67% of patients, while 33.33% of patients were diabetics. The prevalence of most common underlying disorders in the right HF class was similar to that in other groups; 20% of patients were with diabetes mellitus and 20% with chronic obstructive pulmonary disease. Idiopathic dilated cardiomyopathy was present only in 7% of all patients.

***Table 3*. Baseline characteristics, underlying and concomitant diseases of patients with acute heart failure by clinical classification**

Variable	All		Decompensated HF		Pulmonary edema		Cardiogenic shock		Hypertensive HF		Right HF	
	N	%	N	%	N	%	N	%	N	%	N	%
Number	200	100.00	132	66.00	26	13.00	22	11.00	15	7.50	5	2.50
Age, mean (SD)	66.92 (12.5)		66.78 (12.7)		69.27 (8.4)		67.77 (10.9)		65.47 (16.3)		59.00 (17.8)	
Age, IQR	59.25–75.00		58.25–75.00		63.75–77.75		59.00–76.50		53.00–78.00		43.00–71.50	
Male	130	65.00	83	62.88	16	61.54	19	86.36	10	66.67	2	40.00
Body mass index (kg/m^2)	28.2		28.2		25.7		26.2		33.9		33.1	
New-onset AHF	55	27.50	6	4.55	17	65.38	21	95.45	10	66.67	1	20.00
Hospitalization for HF within last 12 months	119	59.50	88	66.67	14	53.85	5	22.73	7	46.67	5	100.00
Underlying diseases:												
Hypertension	141	70.50	88	66.67	19	73.08	16	72.73	15	100.00	3	60.00
CHD	114	57.00	77	58.33	18	69.23	9	40.91	7	46.67	3	60.00
Valvular disease	65	32.50	47	35.61	4	15.38	9	40.91	3	20.00	2	40.00
Dilated cardiomyopathy	14	7.00	13	9.85	1	3.85	0	0.00	0	0.00	0	0.00
Concomitant diseases:												
Anemia	111	55.50	89	67.42	13	50.00	2	9.09	4	26.67	3	60.00
Atrial fibrillation/flutter	104	52.00	76	57.58	14	53.85	5	22.73	7	46.67	2	40.00
Diabetes mellitus	36	18.00	21	15.91	7	26.92	2	9.09	5	33.33	1	20.00
Chronic obstructive pulmonary disease	29	14.50	22	16.67	2	7.69	0	0.00	4	26.67	1	20.00
Pacemaker implanted	18	9.00	14	10.61	0	0.00	1	4.55	3	20.00	0	0.00
Previous stroke or TIA	16	8.00	8	6.06	4	15.38	1	4.55	3	20.00	0	0.00
Renal failure	16	8.00	10	7.58	3	11.54	2	9.09	1	6.67	0	0.00

HF – heart failure; AHF – acute heart failure; CHD – coronary heart disease; TIA – transient ischemic attack.

Baseline characteristics and precipitating factors by clinical classification

In the decompensated HF group, the most frequent precipitating factors were noncompliance with or reduction in drug therapy, progression of valvular heart disease, and arrhythmia (68.18%, 59.09%, and 43.18%, respectively) (Table 4). Acute coronary syndromes (ACSs) as precipitating factors were common in the pulmonary edema class (69.23%) and more frequent in the cardiogenic shock group (90.91%). Noncompliance with or reduction in HF drug therapy dominated among hypertensive HF and right HF patients. Valvular heart disease also led to AHF in 49% of the patients. Ventricular arrhythmias were infrequent precipitating factors in all the study groups (3.5% of all patients).

Echocardiographic findings by previous history of heart failure and by clinical class

Transthoracic two-dimensional echocardiography with assessment of left ventricular ejection fraction (LVEF) was performed to nearly all the patients (199/200) (Table 5). Overall, mean LVEF was 32.6%±14.5%, but de novo AHF patients were more likely to have a greater mean LVEF (35.83%±14.4% vs. 31.43%±14.5%) than ADCHF patients.

Severely depressed LV function (LVEF <30%) was more common in the ADCHF group (46.9% vs. 29.63%; $P<0.05$). HF with preserved systolic function (LVEF =45%) was more frequent in the patients with de novo AHF (31.48% vs. 27.59%). Moderate diastolic dysfunction was more common in the patients with de novo AHF (Table 5), as well as severe mitral regurgitation. Severe tricuspid regurgitation was more frequently observed in the patients with ADCHF (20.69% vs. 9.26%; $P<0.05$).

According to LVEF, all the patients were categorized into three groups: with an LVEF of less than 30%, with an LVEF of 30 to 44%, and with an LVEF of more than 45%. Forty-two per cent of all the patients had an LVEF of less than 30%, 29.15% had an ejection fraction between 30% and 44%, and 28.64% had an ejection fraction greater than 45%.

These three groups were studied in detail to make a comparison of findings in the HF group with preserved LVEF and in the HF group with depressed systolic function. In the patients with decompensated HF, a substantial proportion (50.76%) had an LVEF of less than 30%. Preserved LVEF was common in the patients with hypertensive HF and right HF. Mitral regurgitation was diagnosed in 99% of patients; severe in 23.12%, mostly for patients with decompensated HF (30%), pulmonary edema (16%), and cardiogenic shock (9.09%). Relative tricuspid regurgitation was diagnosed in 97.49%; severe, in 17.6% of the patients and most frequently in the decompensated HF (20.45%), cardiogenic shock (9.09%), pulmonary edema (8%), and right HF (60%) groups (Table 6). Severe relative tricuspid regurgitation rates were high in the patients with right HF.

Differences in heart failure diagnostic modalities between the study groups

Electrocardiographic records were performed for 100% of the study population (Table 7). Rhythm and/or conduction abnormalities can also be detected by 24-hour electrocardiographic (Holter) monitoring, but this method was used only in 4.5% of the patients.

Chest x-ray examination has an important role in diagnosis of AHF. That is why the chest x-ray was performed in the large proportion of the study population (99.5%), just with an exception for some patients with cardiogenic shock.

Echocardiography is a useful objective test in the assessment of cardiac structural disease, as well as evolution of function. It was performed in 99.5% of patients.

Coronary angiography was used to assess the coronary arteries in 57.5% of patients: angiography was performed in all cardiogenic shock patients, half of the patients with pulmonary edema (53.85%), and decompensated HF (56.82%).

A biochemical marker of HF – brain natriuretic peptide – correlates with the severity of HF and prognosis; however, its routine assessment is still limited, and the test was made just for 6.5% of patients, mainly for those with decompensated HF.

Computed tomography (CT) was used to define the cause of right HF in 40% of cases and just for every seventh patient with pulmonary edema or cardiogenic shock (Table 7).

Exercise tolerance testing for assessment of functional capacity was performed in 8% of patients with AHF.

Electrophysiological study was performed for 0.5% of the study group patients.

Inhospital treatment of acute heart failure

On admission, 35.5% of study patients were ventilated mechanically because of severe respiratory failure (Table 8).

In total, there were indications for noninvasive pressure support ventilation by facemask for 30.5% and invasive pressure support ventilation by an

Table 4. **Baseline characteristics and precipitating factors of patients with acute heart failure by clinical classification**

Variable	All		Decompensated HF		Pulmonary edema		Cardiogenic shock		Hypertensive HF		Right HF	
	N	%	N	%	N	%	N	%	N	%	N	%
Number	200	100.00	132	66.00	26	13.00	22	11.00	15	7.50	5	2.50
Age, mean (SD)	66.92 (12.5)		66.78 (12.7)		69.27 (8.4)		67.77 (10.9)		65.47 (16.3)		59.00 (17.8)	
Age, IQR	59.25–75.00		58.25–75.00		63.75–77.75		59.00–76.50		53.00–78.00		43.00–71.50	
Male	130	65.00	83	62.88	16	61.54	19	86.36	10	66.67	2	40.00
Body mass index (kg/m^2)	28.2		28.2		25.7		26.2		33.9		33.1	
New-onset AHF	55	27.50	6	4.55	17	65.38	21	95.45	10	66.67	1	20.00
Hospitalization for HF within last 12 months	119	59.50	88	66.67	14	53.85	5	22.73	7	46.67	5	100.00
Precipitating factors (on admission):												
Noncompliance with therapy	113	56.50	90	68.18	8	30.77	2	9.09	10	66.67	3	60.00
Valvular cause	98	49.00	78	59.09	10	38.46	3	13.64	4	26.67	3	60.00
Arrhythmia	82	41.00	57	43.18	13	50.00	6	27.27	5	33.33	1	20.00
Atrial	75	37.50	53	40.15	13	50.00	3	13.64	5	33.33	1	20.00
Ventricular	7	3.50	4	3.03	0	0.00	3	13.64	0	0.00	0	0.00
ACS	64	32.00	22	16.67	18	69.23	20	90.91	3	20.00	1	20.00
STEMI	43	21.50	12	9.09	12	46.15	19	86.36	0	0.00	0	0.00
Non-STEMI	12	6.00	6	4.55	4	15.38	1	4.55	0	0.00	1	20.00
Unstable angina	9	4.50	4	3.03	2	7.69	0	0.00	3	20.00	0	0.00
Infection	30	15.00	18	13.64	7	26.92	2	9.09	2	13.33	1	20.00

HF – heart failure; AHF – acute heart failure; ACS – acute coronary syndromes; STEMI – ST-elevation myocardial infarction; non–STEMI – without ST-elevation myocardial infarction.

Table 5. **Echocardiographic findings in patients with acute heart failure**

Variable	Total		ADCHF		De novo AHF		*P* value
	N	%	N	%	N	%	
ECHO available, n	199	99.50	145	72.50	54	27.00	
LVEDD, median (IQR), mm	55 (48–62)		57 (50–65)		50 (45–57)		<0.001
EF, mean (SD)	32.63 (14.5)		31.43 (14.5)		35.83 (14.4)		>0.05
LVEF ≥45, %	57	28.64	40	27.59	17	31.48	>0.05
LVEF 30–44, %	58	29.15	37	25.52	21	38.89	>0.05
LVEF<30, %	84	42.21	68	46.9	16	29.63	<0.05
LA, median, mm	48		49		43		>0.05
Diastolic dysfunction, %							
None or mild	26	13.07	11	7.59	15	27.78	<0.001
Moderate	68	34.17	43	29.66	25	46.30	<0.05
Severe	17	8.54	15	10.34	2	3.70	>0.05
Mitral regurgitation, %							
None	2	1.01	2	1.38	0	0.00	>0.05
Mild	77	38.69	51	35.17	26	48.15	>0.05
Moderate	74	37.19	50	34.48	24	44.44	>0.05
Severe	46	23.12	42	28.97	4	7.41	<0.001
Tricuspid regurgitation, %							
None	4	2.01	4	2.76	0	0.00	<0.05
Mild	72	36.18	43	29.66	29	53.70	<0.001
Moderate	87	43.72	67	46.21	20	37.04	>0.05
Severe	35	17.59	30	20.69	5	9.26	<0.05

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; HF – heart failure; ECHO – echocardiography; LV – left ventricular; LVEDD – LV end-diastolic diameter; EF – ejection fraction; LA – left atrial (transversal) diameter.

endotracheal tube for 5% of the studied participants. Among the patients who received noninvasive ventilation, there were mostly patients with pulmonary edema (76.92%) and cardiogenic shock (59.09%), and among the ones who received invasive ventilation, there were mainly patients with cardiogenic shock (22.73%). Mechanical ventilation rate in the intensive care unit was significantly lower for patients with decompensated HF, right HF, and hypertensive HF.

A temporary inotropic support was necessary for 18.5% of patients. Dopamine was used significantly more often than dobutamine or adrenaline (Table 8). Inotropic drugs were used more often in cases of cardiogenic shock and pulmonary edema.

Amiodarone was prescribed for 17% of patients, mainly in cases of decompensated HF (21.21%) or cardiogenic shock (13.64%).

Two-thirds of the admitted patients were given anticoagulants: 51% of patients were treated with unfractionated heparin (UFH) and 20% with low-molecular-weight heparin (LMWH). UFH was widely used in all the studied groups, especially in cases of cardiogenic shock, pulmonary edema, and right HF. Patients were less likely to receive LMWH. It was mostly administered to the studied patients with decompensated HF.

A small proportion of the patients underwent interventional treatment (Table 8), including pacemaker implantation (4.5%), implantable cardioverter/defibrillator (2%), and intra-aortic balloon counterpulsation (3.5%). Some patients were subjected to primary (12.5%) or elective percutaneous coronary intervention (0.5%) or emergent surgical revascularization (6%). The interventional procedures were performed during the inhospital stay.

Specific features of cardiovascular pharmacotherapy

Patterns of how HF patients were treated are shown in Table 9.

Patients were more likely to receive angiotensin-converting enzyme inhibitors (ACEIs), diuretics, beta-blockers (BBs), oral nitrates, antiarrhythmic drugs, but were less likely to receive angiotensin receptor blockers, calcium channel blockers, digoxin. Aspirin, vitamin K antagonists were used more frequently than clopidogrel.

Diuretics were used more frequently to treat ADCHF than de novo AHF patients (57.93% and 27.27%, $P<0.001$). An overall prescription rate

Table 6. **Echocardiographic findings by clinical class of patients with acute heart failure**

Variable	All		Decompensated HF		Pulmonary edema		Cardiogenic shock		Hypertensive HF		Right HF	
	N	%	N	%	N	%	N	%	N	%	N	%
ECHO available, n	199	99.5	132	66	25	12.50	22	11.00	15	7.50	5	2.50
LVEDD, median (IQR), mm	55 (48–62)		58 (52–66)		54 (49–58.2)		48 (43.75–53.25)		50 (46–50)		43.4 (31.5–50)	
EF, mean (SD)	32.63 (14.5)		29.91 (13.8)		33.64 (15.4)		32.86 (13.3)		50.47 (7.2)		44.80 (5.3)	
LVEF ≥45, %	57	28.64	28	21.21	9	36.00	5	22.73	12	80.00	3	60.00
LVEF 30–44, %	58	29.15	37	28.03	6	24.00	10	45.45	3	20.00	2	40.00
LVEF <30, %	84	42.21	67	50.76	10	40.00	7	31.82	0	0.00	0	0.00
LA, median, mm	48		50		45		42		42		38	
Diastolic dysfunction, %												
None or mild	26	13.07	11	8.33	5	20.00	8	36.36	1	6.67	1	20.00
Moderate	68	34.17	39	29.55	10	40.00	10	45.45	7	46.67	2	40.00
Severe	17	8.54	15	11.36	0	0.00	1	4.55	1	6.67	0	0.00
Mitral regurgitation, %												
None	2	1.01	2	1.52	0	0.00	0	0.00	0	0.00	0	0.00
Mild	77	38.69	43	32.58	8	32.00	15	68.18	7	46.67	4	80.00
Moderate	74	37.19	47	35.61	13	52.00	5	22.73	8	53.33	1	20.00
Severe	46	23.12	40	30.30	4	16.00	2	9.09	0	0.00	0	0.00
Tricuspid regurgitation, %												
None	4	2.01	2	1.52	0	0.00	1	4.55	1	6.67	0	0.00
Mild	72	36.18	40	30.30	11	44.00	14	63.64	7	46.67	0	0.00
Moderate	87	43.72	62	46.97	12	48.00	5	22.73	6	40.00	2	40.00
Severe	35	17.59	27	20.45	2	8.00	2	9.09	1	6.67	3	60.00

HF – heart failure; ECHO – echocardiography; LV – left ventricular; LVEDD – LV end-diastolic diameter; EF – ejection fraction; LA – left atrial (transversal) diameter.

Table 7. **Diagnostic investigations and procedures by clinical class of patients with acute heart failure**

Procedure performed	All		Decompensated HF		Pulmonary edema		Cardiogenic shock		Hypertensive HF		Right HF	
	N	%	N	%	N	%	N	%	N	%	N	%
ECG	200	100.00	132	100.00	26	100.00	22	100.00	15	100.00	5	100.00
Chest x-ray	199	99.50	132	100.00	26	100.00	21	95.45	15	100.00	5	100.00
Echo	199	99.50	132	100.00	25	96.15	22	100.00	15	100.00	5	100.00
Angiography	115	57.50	75	56.82	14	53.85	22	100.00	3	20.00	1	20.00
CT scan	25	12.50	14	10.61	4	15.38	3	13.64	2	13.33	2	40.00
Exercise test	16	8.00	15	11.36	0	0.00	0	0.00	1	6.67	0	0.00
BNP/NT-proBNP	13	6.50	12	9.09	0	0.00	0	0.00	0	0.00	1	20.00
Holter ECG	9	4.50	6	4.55	1	3.85	1	4.55	1	6.67	0	0.00
EP study	1	0.50	0	0.00	0	0.00	0	0.00	1	6.67	0	0.00

HF – heart failure; ECG – electrocardiography; Echo – echocardiography (performed during index hospitalization); CT – computed tomography; EP – electrophysiology; ECHO – performed during index hospitalization; BNP – brain natriuretic peptide; NT-proBNP – N-terminal pro-BNP.

Table 8. **Acute cardiac care by clinical class of patients with acute heart failure**

Treatment performed	All		Decompensated HF		Pulmonary edema		Cardiogenic shock		Hypertensive HF		Right HF	
	N	%	N	%	N	%	N	%	N	%	N	%
Number	200	100.00	132	100.00	26	100.00	22	100.00	15	100.00	5	100.00
Ventilatory support	61	30.50	24	18.18	20	76.92	13	59.09	3	20.00	1	20.00
Invasive mechanical ventilation	10	5.00	1	0.76	3	11.54	5	22.73	1	6.67	0	0.00
Diuretic	30	15.00	25	18.94	0	0.00	0	0.00	3	20.00	2	40.00
Oral												
Intravenous bolus	148	74.00	97	73.48	25	96.15	13	59.09	10	66.67	3	60.00
Infusion	1	0.50	0	0.00	1	3.85	0	0.00	0	0.00	0	0.00
Opioids	13	6.50	7	5.30	5	19.23	0	0.00	1	6.67	0	0.00
Intravenous nitrate	88	44.00	45	34.09	22	84.62	9	40.91	10	66.67	2	40.00
Intravenous inotrope												
Adrenaline	3	1.50	0	0.00	1	3.85	2	9.09	0	0.00	0	0.00
Dobutamine	3	1.50	2	1.52	1	3.85	0	0.00	0	0.00	0	0.00
Dopamine	31	15.50	6	4.55	3	11.54	21	95.45	1	6.67	0	0.00
Amiodarone	34	17.00	28	21.21	2	7.69	3	13.64	1	6.67	0	0.00
Heparin (UHF)	102	51.00	54	40.91	19	73.08	18	81.82	7	46.67	4	80.00
LMWH	40	20.00	34	25.76	3	11.54	2	9.09	1	6.67	0	0.00
PCI												
Performed	25	12.50	9	6.82	4	15.38	12	54.55	0	0.00	0	0.00
Planned	1	0.50	0	0.00	0	0.00	1	4.55	0	0.00	0	0.00
IABP	7	3.50	2	1.52	1	3.85	4	18.18	0	0.00	0	0.00
Pacemaker	9	4.50	5	3.79	1	3.85	3	13.64	0	0.00	0	0.00
ICD	4	2.00	3	2.27	0	0.00	1	4.55	0	0.00	0	0.00
CABG												
Performed	12	6.00	8	6.06	0	0.00	3	13.64	1	6.67	0	0.00
Planned	33	16.50	19	14.39	5	19.23	6	27.27	2	13.3	1	20.00

HF – heart failure; UHF – unfractionated heparin; LMWH – low-molecular-weight heparin; PCI – percutaneous coronary intervention; IABP – intra-aortic balloon pump; ICD – implantable cardioverter defibrillator; CABG – coronary artery bypass graft.

Table 9. **Medication on admission and at discharge of patients with acute heart failure**

Prescription rates	Admission							Discharge						
	All		ADCHF		De novo AHF		*P* value	All		ADCHF		De novo AHF		*P* value
	N	%	N	%	N	%		N	%	N	%	N	%	
Number	200	100.00	145	72.50	55	27.50		181	100.00	138	76.24	43	23.76	
Cardiovascular medication														
Digoxin	37	18.50	33	22.76	4	7.27	<0.001	30	16.57	27	19.57	3	6.98	<0.05
Diuretic	99	49.50	84	57.93	15	27.27	<0.001	175	96.69	137	99.28	38	88.37	<0.05
ACE-inhibitors (ACE-I)	116	58.00	90	62.07	26	47.27	>0.05	145	80.11	108	78.26	37	86.05	>0.05
ARB	1	0.50	1	0.69	0	0.00	>0.05	11	6.08	11	7.97	0	0.00	<0.001
Beta-blocker (BB)	79	39.50	65	44.83	14	25.45	<0.01	113	62.43	81	58.70	32	74.42	<0.05
Oral nitrate	54	27.00	39	26.90	15	27.27	>0.05	58	32.04	39	28.26	19	44.19	>0.05
Spironolactone	51	25.50	46	31.72	5	9.09	<0.001	119	65.75	100	72.46	19	44.19	<0.001
BB/ACE-I(ARB)/ Spironolactone	21	10.50	19	13.10	2	3.64	<0.05	64	35.36	51	36.96	13	30.23	>0.05
Calcium channel blocker	20	10.00	13	8.97	7	12.73	>0.05	19	10.50	10	7.25	9	20.93	<0.05
Other vasodilator	10	5.00	7	4.83	3	5.45	>0.05	13	7.18	11	7.97	2	4.65	>0.05
Antiarrhythmic drug	29	14.50	24	16.55	5	9.09	>0.05	62	34.25	46	33.33	16	37.21	>0.05
Antithrombotic agents														
Aspirin	66	33.00	46	31.72	20	36.36	>0.05	52	28.73	28	20.29	24	55.81	<0.001
Clopidogrel	5	2.50	3	2.07	2	3.64	>0.05	31	17.13	13	9.42	18	41.86	<0.001
Vitamin K antagonist	57	28.50	51	35.17	6	10.91	<0.001	104	57.46	92	66.67	12	27.91	<0.001
Other medication														
Lipid-lowering drug	13	6.50	11	7.59	2	3.64	>0.05	61	33.70	36	26.09	25	58.14	<0.001
Other CV medication	15	7.50	10	6.90	5	9.09	>0.05	41	22.65	31	22.46	10	23.26	>0.05
Oral antihyperglycemic therapy	15	7.50	9	6.21	6	10.91	>0.05	14	7.73	11	7.97	3	6.98	>0.05
Insulin	12	6.00	9	6.21	3	5.45	>0.05	11	6.08	9	6.52	2	4.65	>0.05

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; ACE-I – angiotensin-converting enzyme inhibitor; ARB – angiotensin receptor blocker; CV – cardiovascular.

changed markedly during the inhospital stay, but the use of diuretics remained much higher in the ADCHF group than in the de novo AHF group (99.28% and 88.37%, $P<0.05$).

On admission, digoxin was used to treat ADCHF significantly more frequently than to treat de novo AHF patients (in 22.76% and 7.27% of cases, $P<0.001$). The overall prescription rate at discharge was lower than on admission (19.57% and 6.98%, $P<0.05$).

Neurohormonal blockers were used not for all patients, and the dosage was increased on discharge in comparison with dosage at admission: ACE inhibitors were used by 58.00% of the patients on admission and by 80.11% at discharge ($P<0.001$); beta-blockers, by 39.5% vs. 62.43%, respectively ($P<0.001$); spironolactone, by 25.5% and 65.75%, respectively ($P<0.001$). There were significant differences in use of these medications during inhospital stay, whereas at discharge from the hospital, the prescription rate of these medications was higher.

Calcium channel blockers were prescribed just for a small proportion of all the studied patients (10.5%), only for those with preserved systolic function.

One-third of the survey participants used to take vitamin K antagonists before admission to the hospital, but the rate of use was increased twice at discharge (28.5% vs. 57.46%, $P<0.001$).

A proportion of lipid-lowering drug users was very small on admission, but it was significantly greater at discharge (6.5% vs. 33.7%, $P<0.001$).

Although there were significant differences in pharmacological treatment of patients on admission and at discharge in both the groups of the patients (ADCHF and de novo AHF), more significant change of treatment was made for the patients with de novo AHF: the use of diuretics (27.27% vs. 88.37, $P<0.001$), spironolactone (9.09% vs. 44.19%, $P<0.001$), ACE inhibitors (47.27% vs. 86.05%, $P<0.001$), and beta-blockers (25.45% vs. 74.42%, $P<0.001$) was increased; calcium channel blockers (12.73% vs. 20.93%) at discharge were used more frequently.

At admission, there were differences in the medication spectrum between the two main groups of patients (ADCHF and de novo AHF) also. The use of all the drugs used for HF treatment on admission was significantly lower in the patients with de novo AHF, except for oral nitrates (26.9% for ADCHF and 27.27% for de novo AHF, $P>0.05$): calcium channel blockers (8.97% and 12.73%, $P>0.05$), aspirin (31.72% and 36.36%, $P>0.05$), and clopidogrel (2.07% and 3.64%, $P>0.05$).

During the 12-month follow-up period, the rate of medication use had a tendency to decrease (Table 10) in comparison with the rate at discharge from the hospital. The most significant decrease in use was noticed for diuretics (96.6% vs. 80.0%), spironolactone (65.75% vs. 47.41%), ACE inhibitors (80.11% vs. 68.15%), and lipid-lowering drugs (33.7% vs. 11.85%), whereas beta-blockers were prescribed more frequently (62.43% vs. 66.67%).

Outcomes and economic variables

Inhospital mortality of all the studied patients was 9.5%. Mortality rate was significantly higher in the patients with de novo AHF than in the patients with ADCHF (18.18% vs. 4.83%; $P<0.05$). Inhospital mortality rate varied widely in different groups, ranging from 3.03% to 36.36%. The highest mortality rate was observed in patients with cardiogenic shock (36.36%), right HF (20%), pulmonary edema (19.2%), and lower in hypertensive HF (6.67%) and decompensated HF (3.03%).

The overall 12-month mortality rate was 28.5%. The death rates ranged from 31.7% in the ADCHF to 40% in the de novo AHF groups. Mortality rates increased in patients with cardiogenic shock, pulmonary edema, decompensated HF during the hospital stay. The lowest mortality rate (20%) was in the hypertensive heart failure group (Table 11).

Life-threatening arrhythmias were observed in 10.5% of all the patients, and their rate differed depending on the study group: arrhythmias were more frequent in the patients with cardiogenic shock and de novo AHF than in the patients with decompensated HF (45.5%, 29%, and 3.79%, respectively). Arrhythmias were not characteristic of the patients with hypertensive HF (Table 10).

The mean length of inhospital stay (LOS) in all AHF patients was 13 (from 10 to 18) days. More increased LOS was for the patients with right HF (up to 28 days). At least one day was spent in an intensive care unit by 65.5% of patients. Comparison of mean LOS spent in the intensive care unit by the patients of five groups has shown that it was the longest for patients with right HF (three days). A slightly shorter time was spent in the intensive care unit by de novo AHF (two days) and ACDHF patients (one day).

Discussion

This study enrolled a cohort of patients with symptomatic AHF (ADCHF and de novo AHF) who were allocated to five groups according to the European Society of Cardiology guidelines on the

Table 10. **Medication at 3-month and 12-month follow-up of patients with acute heart failure**

Prescription rates	3-month follow-up							12-month follow-up						
	All		ADCHF		De novo AHF		*P* value	All		ADCHF		De novo AHF		*P* value
	N	%	N	%	N	%		N	%	N	%	N	%	
Number	159	100.00	125	78.62	34	21.38		135	100.00	106	78.52	29	21.48	
Cardiovascular medication														
Digoxin	25	15.72	22	17.60	3	8.82	>0.05	21	15.56	19	17.92	2	6.90	>0.05
Diuretic	140	88.05	120	96.00	20	58.82	<0.001	108	80.00	88	83.02	20	68.97	>0.05
ACE-inhibitors (ACE-I)	116	72.96	92	73.60	24	70.59	>0.05	92	68.15	70	66.04	22	75.86	>0.05
ARB	7	4.40	7	5.60	0	0.00	<0.01	9	6.67	8	7.55	1	3.45	>0.05
Beta-blocker (BB)	95	59.75	72	57.60	23	67.65	>0.05	90	66.67	70	66.04	20	68.97	>0.05
Oral nitrate	47	29.56	34	27.20	13	38.24	>0.05	41	30.37	30	28.30	11	37.93	>0.05
Spironolactone	95	59.75	82	65.60	13	38.24	<0.01	64	47.41	56	52.83	8	27.59	<0.01
BB/ACE-I(ARB)/ Spironolactone	45	28.30	38	30.40	7	20.59	>0.05	37	27.41	30	28.30	7	24.14	>0.05
Calcium channel blocker	21	13.21	18	14.40	3	8.82	>0.05	13	9.63	10	9.43	3	10.34	>0.05
Other vasodilator	16	10.06	13	10.40	3	8.82	>0.05	22	16.30	15	14.15	7	24.14	>0.05
Antiarrhythmic drug	58	36.48	44	35.20	14	41.18	>0.05	46	34.07	39	36.79	7	24.14	>0.05
Antithrombotic agents														
Aspirin	34	21.38	20	16.00	14	41.18	<0.01	38	28.15	26	24.53	12	41.38	>0.05
Clopidogrel	22	13.84	10	8.00	12	35.29	<0.001	5	3.70	3	2.83	2	6.90	>0.05
Vitamin K antagonist	103	64.78	89	71.20	14	41.18	<0.001	84	62.22	70	66.04	14	48.28	>0.05
Other medication														
Lipid-lowering drug	50	31.45	34	27.20	16	47.06	<0.05	16	11.85	11	10.38	5	17.24	>0.05
Other CV medication	51	32.08	36	28.80	15	44.12	>0.05	46	34.07	36	33.96	10	34.48	>0.05
Oral antihyperglycemic therapy	14	8.81	11	8.80	3	8.82	>0.05	14	10.37	10	9.43	4	13.79	>0.05
Insulin	9	5.66	7	5.60	2	5.88	>0.05	4	2.96	4	3.77	0	0.00	<0.05

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; ACE-I – angiotensin-converting enzyme inhibitor; ARB – angiotensin receptor blocker; CV – cardiovascular.

Table 11. **Outcomes and length of hospital stay of patients with acute heart failure**

Variable	All	ADCHF	De novo AHF	Decomp. HF	Pulm. edema	Cardiog. Shock	Hypert. HF	Right HF
Number	200	145	55	132	26	22	15	5
Inhospital mortality, n (%)	19 (9.5)	7 (4.83)	12 (18.18)	4 (3.03)	5 (19.23)	8 (36.36)	1 (6.67)	1 (20.00)
3-Month mortality, n (%)	15 (7.5)	9 (6.21)	6 (10.91)	8 (6.06)	5 (19.23)	1 (4.55)	1 (6.67)	0 (0.00)
Lost to follow-up at 3 months postinclusion, n (%)	7 (3.5)	4 (2.76)	3 (5.45)	4 (3.03)	1 (3.85)	1 (4.55)	1 (6.67)	0 (0.00)
12-Month mortality, n (%)	23 (11.5)	19 (13.10)	4 (7.27)	17 (12.88)	4 (15.38)	1 (4.55)	1 (6.67)	0 (0.00)
Lost to follow-up at 12 months postinclusion, n (%)	8 (4)	4 (2.76)	4 (7.27)	4 (3.03)	2 (7.69)	1 (4.55)	1 (6.67)	0 (0.00)
LOS, median (IQR), days	13 (10–18)	14 (9–19)	13 (13–17)	14 (10–21)	12 (10–15)	12 (8.75–14)	13 (10–17)	14 (6.5–28)
Staying in CCU, n (%)	131 (65.5)	79 (54.48)	52 (94.55)	69 (52.27)	25 (96.15)	22 (100.00)	10 (66.67)	2 (40.00)
CCU stay, median (IQR), days	1 (1–3)	1 (1–2)	2 (1–4.75)	2 (1–3)	1 (1–3)	1 (1–1.25)	1 (1–3)	3 (1–5)
Life-threatening arrhythmias, n (%)	21 (10.5)	5 (3.45)	16 (29.09)	5 (3.79)	5 (19.23)	10 (45.45)	0 (0.00)	1 (20.00)

ADCHF – acute decompensated chronic heart failure; de novo AHF – acute new onset of heart failure; HF – heart failure; Decomp. – decompensated; Pulm. – pulmonary; Cardiog. – cardiogenic; Hypert. – hypertensive; CCU – coronary care unit; LOS – length of hospital stay.

diagnosis and treatment of AHF (ADCHF, pulmonary edema, hypertensive HF, cardiogenic shock, right HF) (4). It was a unique opportunity to characterize ADCHF and de novo AHF patients, and to compare the characteristics and management of 200 consecutive patients among the five study groups at a single university hospital center within three-month and one-year follow-ups.

The mean age of AHF patients was 67 years. Just 35% of the studied patients were women, and the majority of them (60%) were assigned to the right HF group. An important finding in the study was the fact that the majority (72.5%) of the individuals admitted to the hospital with AHF were CHF patients before admittance to hospital. The similar trend was noticed among the EHFS II patients – 62.9% (3). De novo AHF was diagnosed just for 27.5% of the patients, mainly for males (80%).

A high incidence of comorbidities, which could contribute to hemodynamic instability and congestion, was observed in the study population, especially in the patients with ADCHF. The most frequent underlying disease was ischemic heart disease, present in 57% of the studied participants (6); arterial hypertension was found in more than 70% of the studied patients. Such aggravating conditions as anemia and atrial fibrillation/flutter were present in more than half of the patients (55.5% and 52%, respectively). Atrial fibrillation has already been reported in high frequency in AHF patients before (6–8).

Noncompliance with therapy was a major precipitating factor in more than half of the studied patients (56.5%), whereas in overall EHFS-II surveyed patients, arrhythmias took the first place. As it has been mentioned before, many of the studied patients had already had the diagnosis of CHF and many of them were treated inadequately before hospitalization. The EHFS II has also revealed suboptimal usage of medications by the patients (22.2%), but at lower rates. Valvular dysfunction and arrhythmias were also more common in patients with ADCHF. ACS and infections were more frequent precipitation factors for the patients with de novo AHF, and these findings are almost identical to those of the EHFS II (3). ACS accounted for a majority – about 76% – of the de novo AHF cases and was closely related to development of such conditions as cardiogenic shock and pulmonary edema. Similar results were obtained by the EHFS II survey (3). ACS was much more rare in the ADCHF group (15.17%). Infections were observed in nearly one-fourth of de novo AHF patients, and they were most common in pulmonary edema group. The results

have also shown that the mean age of AHF patients was greater in pulmonary edema (more than 69 years) and cardiogenic shock (68 years) groups.

Echocardiographic examination data were available for the majority of the studied participants (99.5%), which show a good implementation of the current ECS AHF guidelines (4). The mean LVEF was reduced in all the five study groups. More impaired LVEF was observed in the patients with ADCHF. LVEF of <30% was assessed in 46.89% of ADCHF patients and only in 27.8% of patients presenting with de novo AHF. The EHFS II has shown almost the same results (3).

The HF with preserved LVEF was in the patients presenting with hypertensive HF and right HF. Left ventricular ejection fraction of >45% was found in 28.64% of cases, and the results were almost identical to the EHFS-II findings. No echocardiographic follow-up data were recorded in this study.

Valvular dysfunction, as a precipitating factor, was present in large proportions of patients in both de novo and ADCHF groups. Both mitral and tricuspid regurgitations were common, predominantly in the decompensated HF group.

Clinical assessment is mandatory to make a diagnosis of HF, although HF diagnoses could be proven just after the laboratory and instrumental investigations. All the patients have undergone a comprehensive clinical assessment and investigations according to the recommendations of ESC guidelines (4). ECG, echocardiography, and chest x-ray were performed to near all the patients. BNP sampling rate was quite low – only 6.5% of the study population. The discrepancy with guidelines could be explained by a relatively high price of the test.

The management of HF could be divided into four periods: acute therapy during the first 24 h after admission, management of the stabilized or still symptomatic patient over the next few days, establishment of long-term drug treatment before discharge from the hospital, and ongoing outpatient management in the chronic phase (9). All the study patients had undergone intensive treatment in the acute phase. Ventilatory support was needed for one-third of the study patients, mainly for those with pulmonary edema and cardiogenic shock. One-fifth of patients required intravenous inotropic support, which was most common in the patients with pulmonary edema and cardiogenic shock. The most frequently used inotrope was dopamine (for 15.5% of the study patients). Nearly half of the study patients received intravenous nitrates, mainly patients with pulmonary edema.

A large proportion (89%) of participants were treated with intravenous or oral diuretics, and they were more commonly used in decompensated HF and pulmonary edema groups (4, 6). Beta-blockers were not used in acute phase until the hemodynamics was stabilized, as recommended (4, 6, 10). Later they were more frequently used in de novo AHF patients (74.45% vs 58.7%).

Heparin was widely used in all the five groups (71%) and especially in patients presenting with cardiogenic shock, right HF, and pulmonary edema.

Interventions were required in a small proportion of patients. Percutaneous coronary intervention was performed in half of the cardiogenic shock patients, but on the other hand, it was just a minority of all the patients hospitalized with AHF.

During the stay in the hospital, the patients were also treated according to the European Society of Cardiology recommendations (4). The use of loop diuretics, spironolactone, and vitamin K antagonists was significantly higher in the ADCHF group, because of high risk of thromboembolic complications.

While comparing treatment changes made during inhospital treatment, we assessed an increase in the use of HF medications in both the groups of patients, even if a large proportion of them were given beta-blockers, ACE inhibitors, nitrates, and other medicaments at admission. This shows a good adherence to current HF guidelines (4). During a one-year follow-up, the medication prescription rate had a tendency to decrease.

The mean length of inhospital stay was 13 days. It was longer than in the other studies: in the ADHERE, 4.3 days; in the EHFS II, 9 (6–14) days; in the FINN-AKVA, 12 days (3, 7, 12). The longest LOS was noticed for the patients with right HF (up to 28 days) – the same trend as in the EHFS II. A prolonged inhospital treatment was characteristic of both patients groups, with right and decompensated HF.

Despite the use of evidence-based therapy, inhospital and 12-month mortality rates remained still rather high. Inhospital mortality of patients hospitalized with AHF was 9.5%. This mortality rate exceeded the ones reported in several large heart failure clinical trials (e. g., 6.7%, in the EHFS II (3); 7.1%, in the FINN-AKVA (11); 4% in the ADHERE (7); 7%, in the EHFS I (2)), but was lower than in the EFICA study, in which inhospital mortality reached 29% (1).

Survival was longer in patients with less severe presentation of HF. The highest mortality rates were among patients with cardiogenic shock and pulmonary edema, and our data were rather similar to the data of

other studies (4, 11). De novo AHF patients had higher inhospital (18.18% vs. 4.83%) and 12-month (40% vs. 31.7%) mortality rates than the patients with ADCHF. A decrease in medication treatment during a one-year follow-up could also be an aggravating factor, leading to poorer prognosis. Other large studies have found similar suboptimal usage rates of the medications for patients with AHF (7, 11–14). AHF management must be adequate to reduce progression of the disease and mortality rate. Adverse clinical outcomes show the need for improvement of quality in cardiac health care. It must be taken into account when making the decisions concerning the use of more aggressive treatment in the future in order to reduce HF progression, hospital readmission, and poor prognosis.

Conclusions

Preserved systolic function, multiple concomitant diseases, and high mortality rates were observed in a substantial proportion of the patients hospitalized due to acute heart failure. The management of the patients in a university hospital center was performed in accordance with the international guidelines.

Ūminio širdies nepakankamumo diagnostikos ir gydymo savitumai universitetinės ligoninės centre

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Raktažodžiai: ūminis širdies nepakankamumas, lėtinis dekompensuotas širdies nepakankamumas, plaučių edema, kardiogeninis šokas, dešiniojo skilvelio nepakankamumas.

Santrauka. *Tyrimo tikslas.* Įvertinti ūminio širdies nepakankamumo priežastis, komplikacijas, gydymą ir baigtis.

Tyrimo medžiaga ir metodai. Išnagrinėti medicininiai duomenys 200 sergančiųjų ūminiu (27,5 proc.) arba paūmėjusiu lėtiniu širdies nepakankamumu (72,5 proc.), vienerių metų laikotarpiu gydytų Kauno medicinos universiteto Kardiologijos klinikoje. Tiriamieji rodmenys registruoti Antrojo Europos širdies nepakankamumo tyrimo (angl. *Euro Heart Failure Survey – EHFS-II*) anketoje. Tiriamieji suskirstyti į penkias grupes: 1) lėtinio dekompensuoto širdies nepakankamumo (66,0 proc.); 2) plaučių edemos (13,0 proc.); 3) hipertenzijos sąlygoto širdies nepakankamumo (7,5 proc.); 4) kardiogeninio šoko (11,0 proc.); 5) dešiniojo skilvelio nepakankamumo (2,5 proc.).

Rezultatai. Vyraujančios ūminio širdies nepakankamumo priežastys buvo hipertenzinė bei išeminė širdies ligos. Daugiau kaip pusei tiriamųjų širdies nepakankamumo paūmėjimą paspartino nepakankamas ambulatorinis medikamentinis gydymas. Kairiojo skilvelio išstūmimo frakcija daugiau kaip 45 proc. rasta 28,64 proc. pacientų. Ūminiu ligos laikotarpiu dažniausiai vartoti intraveniniai diuretikai (74,5 proc.), nitratai (44,0 proc.) bei heparinas (71,0 proc.). 96,69 proc. pacientų, išvykstančių iš stacionaro, vartojo diuretikus, 80,11 proc. – angiotenziną konvertuojančio fermento inhibitorius, 62,43 proc. – beta-adrenoblokatorius. Gydymo stacionare vidutinė trukmė – 13 dienų. Mirštamumas stacionare – 9,5 proc., po 3 mėn. – 7,5 proc., po 12 mėn. – 11,5 proc.

Išvados. Didžiajai daliai sergančiųjų ūminiu širdies nepakankamumu buvo nustatyta išlikusi sistolinė kairiojo skilvelio funkcija, dauginės gretutinės ligos bei didelis mirštamumas ligoninėje, po 3 mėn. bei po vienerių metų. Gydymas universitetinėje ligoninėje atitiko tarptautines ūminio širdies nepakankamumo gydymo nuorodas.

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