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Chronic heart failure in the elderly: still a current medical problem

AGNIESZKA SKRZYPEK¹, MAGDALENA MOSTOWIK¹, MARTA SZELIGA¹,
MAGDALENA WILCZYŃSKA-GOLONKA², DOROTA DĘBICKA-DĄBROWSKA¹,
JADWIGA NESSLER^{2,3}

¹Department of Medical Education, Jagiellonian University Medical College
Kraków, Poland

²John Paul II Hospital, Kraków, Poland

³Department of Coronary Disease, Institute of Cardiology, Jagiellonian University Medical College
Kraków, Poland

Corresponding author: Agnieszka Skrzypek, MD, PhD

Department of Medical Education, Jagiellonian University Medical College, School of Medicine
ul. św. Łazarza 16, 31-530 Kraków, Poland

Phone: +48 609 731 609; Phone/Fax: +48 12 619 97 08; E-mail: agnieszka.skrzypek@gmail.com

Abstract: Congestive heart failure (CHF) is the final stage in several heart diseases. The diagnosis of CHF in older patients is a challenge. Preserved left ventricular systolic function is a characteristic type of CHF in seniors.

The purpose of the study was to characterize elderly patients with CHF and to highlight specific features of the conditions in seniors. The most common etiology of HF in this group of patients is hypertension and coronary heart disease. In seniors atypical presentations of chronic heart failure is much more common than in younger patients. Malnutrition, limitations of exercise and sedentary lifestyles or comorbid diseases have an influence on asymptomatic, early stage of HF. There are better outcomes of treatment in obese individuals. It is called the obesity paradox. Open communication with a patient and his/her family may improve their response to therapy. When heart failure becomes an incurable disease and aggressive treatment is ineffective, palliative care should be considered in end-of-life heart failure patients. The goal of treatment in the remaining moments of life last moments of life should be maximizing the patient's comfort.

Key words: congestive heart failure, seniors, palliative care, cachexia.

Introduction

Congestive heart failure (HF) is the final stage in several heart diseases (cardiomyopathies, valvular or ischemic heart disease and many others) [1]. Reduced in-hospital mortality and length of hospital stay in seniors are results of improvement in the treatment of cardiovascular disease, for example, revascularization therapy for acute myocardial infarction and strict control of hypertension or effective treatment of valvular disease [2, 3].

HF is the leading cause of hospitalization in the elderly [4–6] and represents a challenging problem to national health problem for the economy [7]. More than half of all patients hospitalized with acute decompensated heart failure are older than 75 years of age, approximately 20% of these patients are in the very-elderly age group: 85 years and older [8]. The mean age of the overall population with HF differs in various countries. This finding probably reflects different life expectancies, specific to each country. The mean age of the overall population with HF, for example, in Poland is 69.1 ± 12.3 years (by the Polish ESC-HF Long-Term Registry); in the United States it is 73.2 ± 14 years (OPTIMIZE-HF) and in Japan it is 72.9 ± 13.8 years (ATTEND) [9]. 65 years of age or more is the established definition of what is considered an elderly age, but the clinical conditions of people aged 65 to 74 have improved. Nowadays, patients aged 75 years or older define the group in which the diagnosis of HF increases [9]. It seems reasonable to reevaluate the threshold of the so-called “older age” [9].

Nevertheless, there are strict criteria for the diagnosis of HF; unusual clinical manifestations and other comorbid conditions in seniors make the diagnosis more challenging [8, 10, 11].

The optimal management of HF in seniors is a growing health care priority because cumulative morbidity, mortality and associated costs escalate as the aging population increases [8].

Previous studies describing the elderly population suffering from chronic heart failure have indicated that sufferers tend to be female with a preserved left ventricular systolic function [12, 13].

Some studies have shown an underdosage of recommended medications and less frequent usage of evidence-based therapies in seniors [14]. The European Society of Cardiology does not recommend specific guidelines of treatment for seniors with HF [15].

Objectives

The purpose of the study was to characterize the elderly patients with chronic heart failure and to highlight specific features of the conditions in seniors.

Risk factors of chronic heart failure

Several morphological and physiological changes in the aging population contribute to heart failure [16, 17]. Comorbidities and variations at the cellular and the clinico-pathophysiological level may interact with a lifelong exposure to the risk factors of cardiac and vascular diseases leading to heart failure [16].

The most common etiology of HF is hypertension and coronary heart disease [16, 18].

Jugdutt BI. considered heart failure as “superimposed on an ongoing process”, which is often described as the end stage of cardiovascular disease [19]. Studies by Gregory A. Nichols has shown that chronic heart failure in diabetic patients is also a common occurrence. Subjects suffering from diabetes who developed HF differed from patients who did not develop the disease. Firstly, they were significantly older. However, clinicians noted that diabetic subjects who developed HF were, on average, 5.5 years younger than non-diabetic patients who developed CHF [20]. Secondly, patients with HF had diabetes for a longer period of time, worse glycemic control (manifested by higher HbA_{1c}), higher blood pressure and more advanced kidney disease than diabetic subjects without HF. Moreover, ischemic heart disease, insulin and metformin usage were more common in those with HF [20].

The most common type of HF in seniors is one with preserved ejection fraction (HFpEF) [16]. Studies have shown that 55% of older patients with HF have left ventricular ejection fraction (LVEF) higher than 50%, and 80% of seniors have a normal or mildly reduced systolic function (with an LVEF of 50% ± 5%) [16, 21]. Masoudi FA and other scientists have noted an association between the female gender and preserved ejection fraction in hospitalized elderly subjects [22].

Clinical assessment

In seniors atypical presentations of chronic heart failure is much more common than in younger patients. Some factors, such as cognitive deficits, memory changes, anxiety, insomnia, psychosis, frailty may contribute to the later onset of symptoms of the disease [16]. Also malnutrition, limitations of exercise and sedentary lifestyles or comorbid diseases such as musculoskeletal or respiratory disorders, malignancies, immobility all have an influence on the long, asymptomatic early stage of HF. Other signs and symptoms may result from comorbid diseases, for example, fluid overload in renal disease, fatigue secondary to anemia or infections, which may complicate the presentations of HF (example dyspnea). Crackles or pleural effusions may be due to coexistent diseases, not only with chronic heart failure. Peripheral edema may be connected with venous insufficiency [23]. Alternative diagnoses may delay the proper diagnosis of HF. The comorbidities can worsen or exacerbate the course of chronic

heart failure. Therefore, recognizing subtle changes in the medical history or physical examination of older patients is particularly important [16].

Typical symptoms of chronic heart failure in seniors are fatigue, weakness, dizziness and change in mental status [16]. Exertional dyspnea is not common in seniors because of immobility and iatrogenic factors such as a low salt diet or digoxin toxicity [24]. Also jugular venous distention may be absent, despite an overload of fluid [16].

More importantly, older patients may decrease their physical activities to compensate for their reduced efficiency resulting from HF. Hence careful history taking and inquiring about medication, fluid intake changes and recent hospitalizations may have an impact on the proper diagnostic and therapeutic decisions. Clinicians should be careful when treating seniors because even a slight change in drug dosage may have serious clinic consequence, for example, electrolyte disturbances caused by diuretics can lead to delirium [16].

It is recommended to evaluate heart rhythm regularly, as well as orthostatic changes in blood pressure, nutritional and mental status and changes in daily activities of patients, because subtle changes of these may be determinants of the progression of HF and the need to modify treatment [16].

Physiological changes in age. Echocardiographic differences. Influence of other diseases on the course of heart failure in older patients

The heart undergoes physiological and structural changes with age [25]. Some diseases that occur more often with age (for example, diabetes, chronic kidney disease, hypertension, obesity) may result in the stiffening of the myocardium and lead to diastolic dysfunction, which is particularly frequent in women [9, 26]. According to an analysis by Ozierański K., heart failure with preserved ejection fraction, with a threshold of 50% or higher, occurred more often in patients aged 65 years or older than in younger groups [9]. Some studies confirm that HF in the elderly results from ischemic or valvular heart disease [9, 10, 27]. The most common valvular heart disease in seniors with HF is aortic stenosis [9].

The frequency of atherosclerosis and arterial stiffening increase in the aging population [9]. It is associated with the progression of cardiovascular disease, limited physical activity and a worse general physical condition [9]. Moreover, atherosclerosis results in longer hospital stays, heart rhythm disturbances and other complications [28]. The heart with age becomes less responsive to catecholamine and neurological stimulation. It is unable to increase the strength and rate of its contractions [9]. This disability contributes to pacemaker implantation, especially in patients aged 65 or older [9]. Also atrial fibrillation, which is common in seniors with HF [29], often leads to stroke, especially in patients aged 75 years or older, who

were less frequently treated with anticoagulants, because of a higher risk of bleeding [9]. So, clinicians should carefully assess the individual risk for thromboembolic and bleeding occurrences [29, 30].

The prevalence of chronic obstructive pulmonary disease [COPD] in older patients with HF is very common (about 40% of patients with HF) [31], and it is an independent predictor of death and hospitalization [30]. COPD and coexisting left ventricular dysfunction are the highest risk factors of mortality in seniors [9].

Natriuretic peptide and its use

Brain natriuretic peptide (BNP) and NT-proBNP are well-known biomarkers of chronic heart failure and useful in the preliminary diagnosis of the disease. These biochemical markers also have prognostic value [5]. They may also be a useful diagnostic tool in very elderly patients (above 80 years of age) with typical signs and symptoms of HF in the emergency room. BNP may be considered a marker of an increased risk of cardiac morbidity and total mortality [32].

BNP above 100 pg/ml has a 76% specificity and 90% sensitivity in the diagnosis of HF in patients with symptoms of heart failure [33]. BNP levels increase with age and the best cutoff value for patients above 65 years of age is 250 pg/ml [34].

Thygesen found that in patients above 75 years of age a level of NT-proBNP above 1800 pg/ml has a 73% specificity and 95% sensitivity in diagnosing HF in the group of patients with acute dyspnea [34].

Cachexia and sarcopenia and the obesity paradox

Heart failure is a catabolic state. Cachexia is well-known in patients with end-stage chronic heart failure and this is a risk factor of death in this stage [35].

It is a well-known fact that the risk of cardiovascular diseases in obese patients is increased. However, in patients with HF, previous studies showed better outcomes of treatment in obese individuals [9, 36]. There are observations that obese patients may have a survival benefit in cardiovascular decompensation, such as in myocardial infarction or congestive heart failure [37]. According to Amundson DE obese patients tend to fare better after certain surgical procedures, for example, coronary artery bypass surgery. Obese men with chronic hypertensive heart disease live longer than men with a normal weight [37]. The mechanisms of this phenomenon, so-called the obesity paradox, is unclear [36]. Oga EA gives one of the probable interpretation of the obesity paradox: obese patients may have a more metabolic reserve. These metabolic reserves have great meaning in elderly patients with HF [36].

Adherence to therapy

Adverse effects of medications occur more often in older patients than in younger ones. This fact is because of physiologic changes. A decrease of elasticity of the cardiovascular system, higher systolic arterial blood pressure and left ventricular hypertrophy, impairment of myocardial relaxation and activation of the sympathetic nervous system by a vasoconstrictor response are typical of aging patients [16, 38]. Maison P. and others described the pharmacokinetic and pharmacodynamic effects of cardiovascular medication [39]. They found that a decrease in hepatic blood flow by 20–50% and a reduction of hepatic volume by 20–30% as well as renal mass reduction of 25–30% and a diminution of renal blood flow by 1% had an impact on drug disposition in the organism of elderly patients [40]. In that population not only can the absorption of a drug be impaired, [16] but due to total body water decreasing and body fat increasing, the distribution may be disturbed [40]. Consequently, there is a smaller volume of distribution of digoxin and other water soluble drugs [16]. The change of renal function may affect the clearance of many medications, such as e.g., carvedilol [16]. Moreover, decreased clearance of some ACE inhibitors (such as enalapril or perindopril), cause stronger blood pressure-lowering effects [39]. According to Lavan AH, more than 50% of hospitalizations resulting from adverse drug reactions, particularly diuretics, NSAIDs, antiplatelet, anticoagulant and antidiabetic drugs, can be avoided [41].

Polypragmasia leads to non-adherence to therapy, with a non-adherence rate of 35% in patients taking four or more medications [16, 42]. Non-adherence with diet or pharmacotherapy in patients with chronic heart failure is a common factor that contributes to decompensation of 42% of patients in older age [16]. Complexity of the treatment regimen, the adverse effects of drugs and a patient's perception of the necessity of treatment also affect a patient's compliance [16]. The open communication between the patient and his/her doctor resulting partnership, the process in which the patient is in the centre of all medical decisions can contribute to a stronger commitment of the patient to the care plan [16].

Palliative care

In advanced stages of heart failure, when aggressive treatment becomes ineffective, palliative care should be implemented [16]. The aim of palliative care is to ensure the highest possible quality of life for the patient, for as long as possible [16]. This engages a multidisciplinary approach and the team includes a main physician, nursing team, pastoral care support and other support staff [16]. Focused treatment of specific symptoms, such as severe dyspnea, can help to alleviate patients' discomfort through a complex therapy [16]. This also includes treatment of anxiety and depression of

the patient, and often of the family members [16]. The other aspect of palliative care in the terminal stage is the targeted therapy of specific symptoms, such as constipation, anorexia or sleep disorders [43]. Narcotics, benzodiazepines and sedatives may be used in the treatment of pain and anxiety [44].

In order to avoid aggressive and futile or uncomfortable interventions in the critical stage, instituted hospice services should be introduced early [45]. Many older patients prefer to die in their own home. If family and medical support is available, it should be taken into consideration [46].

Conclusion

Chronic heart failure is widespread in the population of older patients [16]. Some factors, such as structural, biochemical, clinical and psychological aspects are unique to patients in older age [16]. According to Ozierański K. and others, seniors suffering from heart failure differed from young patients in terms of the long-term outcome and prognostic factors [9]. Chronic obstructive pulmonary disease in older patients with HF is very common and is an independent predictor of death and hospitalization [47, 48]. Some factors have protective prognostic effects in patients aged 65 years or older: physical activity, higher potassium level on admission and beta-blocker use at discharge from the hospital [16].

Careful medical history recording, including medications and regular physical examinations are particularly important when treating patients suffering from chronic heart failure.

The main goal of treatment in the end-stage of life should be maximizing the patient's comfort [16].

Conflict of interest

None declared.

References

1. Guha K., McDonagh T.: Heart failure epidemiology: European perspective. *Curr Cardiol Rev.* 2013; 9: 123–127.
2. Jelani A., Jugdutt B.I.: STEMI and heart failure in the elderly: role of adverse remodeling. *Heart Fail Rev.* 2010; 15 (5): 513–521.
3. Mancía G., Fagard R., Narkiewicz K., et al.: 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart J.* 2013; 34 (28): 2159–2219.
4. Thomas S., Rich M.W.: Epidemiology, pathophysiology, and prognosis of heart failure in the elderly. *Heart Fail Clin.* 2007; 3 (4): 381–387.

5. *Metra M., Cotter G., El-Khorazaty J., et al.*: Acute heart failure in the elderly: differences in clinical characteristics, outcomes, and prognostic factors in the VERITAS Study. *J Card Fail.* 2015; 21 (3): 179–188.
6. *Lazzarini V., Mentz R.J., Fiuzat M., et al.*: Heart failure in elderly patients: Distinctive features and unresolved issues. *Eur J Heart Fail.* 2013; 15 (7): 717–723.
7. *Ponikowski P., Voors A.A., Anker S.D., et al.*: 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: the task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur Heart J.* 2016; 37: 2129–2200.
8. *Mizuno M., Kajimoto K., Sato N., Yumino D., Minami Y., Murai K., Munakata R., Asai K., Keida T., Sakata Y., Hagiwara N., Takano T.*: Clinical profile, management, and mortality in very-elderly patients hospitalized with acute decompensated heart failure: An analysis from the ATTEND registry. *Eur J of Int Med.* 2016; 27; 80–85.
9. *Ozierański K., Balsam P., Tymiąska A., Peller M., Kapłon-Cieślicka A., Marchel M., Drożdż J., Filipiak K.J., Opolski G.*: Heart failure in elderly patients: differences in clinical characteristics and predictors of 1-year outcome in the Polish ESC-HF Long-Term Registry. *Pol Arch Med Wewn.* 2016; 126: 7–8.
10. *Pulignano G., Del Sindaco D., Tavazzi L., et al.*: Clinical features and outcomes of elderly outpatients with heart failure followed up in hospital cardiology units: data from a large nationwide cardiology database (IN-CHF Registry). *Am Heart J.* 2002; 143 (1): 45–55.
11. *Metra M., Mentz R.J., Chiswell K., et al.*: Acute heart failure in elderly patients: worse outcomes and differential utility of standard prognostic variables. Insights from the PROTECT trial. *Eur J Heart Fail.* 2015; 17: 109–118.
12. *Forman D.E., Cannon C.P., Hernandez A.F., et al.*: Influence of age on the management of heart failure: Findings from Get With the Guidelines-Heart Failure (GWTG-HF). *Am Heart J.* 2009; 157 (6): 1010–1017.
13. *Conde-Martel A., Formiga F., Perez-Bocanegra C., et al.*: Clinical characteristics and one-year survival in heart failure patients more than 85 years of age compared with younger. *Eur J Intern Med.* 2013; 24 (4): 339–345.
14. *Saczynski J.S., Darling C.E., Spencer F.A., et al.*: Clinical features, treatment practices, and hospital and long-term outcomes of older patients hospitalized with decompensated heart failure: The Worcester Heart Failure Study. *J Am Geriatr Soc.* 2009; 57 (9): 1587–1594.
15. *McMurray J.J., Adamopoulos S., Anker S.D., et al.*: ESC guidelines for diagnosis and treatment of acute and chronic heart failure 2012. *Eur J Heart Fail.* 2012; 14: 803–869.
16. *Bader F., Atallah B., Brennan L.F., Rimawi R.H., Khalil M.E.*: Heart failure in the elderly: ten peculiar management considerations. *Heart Fail Rev.* 2017; 22: 219–228.
17. *Saczynski J.S., Darling C.E., Spencer F.A., et al.*: Clinical features, treatment practices, and hospital and long-term outcomes of older patients hospitalized with decompensated heart failure: the Worcester Heart Failure Study. *J Am Geriatr Soc.* 2009; 57 (9): 1587–1594.
18. *Roger V.L., Go A.S., Lloyd-Jones D.M., et al.*: Heart disease and stroke statistics—2011 update: A report from the American Heart Association. *Circulation.* 2011; 123: e18–209.
19. *Jugdutt B.I.*: Aging and heart failure: changing demographics and implications for therapy in the elderly. *Heart Fail Rev.* 2010; 15: 401–405.
20. *Nichols G.A., Gullion Ch.M., Koro C.E., Ephross S.A., Brown J.B.*: The Incidence of Congestive Heart Failure in Type 2 Diabetes. An update. *Diabetes Care.* 2004; 27 (8): 1879–1884. <https://doi.org/10.2337/diacare.27.8.1879>.
21. *Kitzman D.W., Gardin J.M., Gottdiener J.S., et al.*: Cardiovascular Health Research Group. Importance of heart failure with preserved systolic function in patients > or = 65 years of age. CHS research group. *Cardiovascular health study.* *Am J Cardiol.* 2001; 87 (4): 413–419.

22. Masoudi F.A., Havranek E.P., Smith G., et al.: Gender, age and heart failure with preserved left ventricular systolic function. *J Am Coll Cardiol.* 2003; 41: 217–223.
23. DeBacker N.A.: History and physical examination of the older adult. *History and Physical Examination of the Older Adult.* June 1999; http://projects.galter.northwestern.edu/geriatrics/chapters/history_physical_exam.pdf Accessed July 1, 2016.
24. Alcindor F.: Geriatrics: managing congestive heart failure. *Emergency Physicians Monthly*; <http://epmonthly.com/article/geriatrics-managing-congestive-heart-failure/> Accessed July 1, 2016.
25. Flather M.D., Shibata M.C., Coats A.J., et al.: Randomized trial to determine the effect of nebivolol on mortality and cardiovascular hospital admission in elderly patients with heart failure (SENIORS). *Eur Heart J.* 2005; 26: 215–225.
26. Fonarow G.C., Abraham W.T., Albert N.M., 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: 107–115.
27. Candreva A., Maisano F., Taramasso M.: MitraClip and transcatheter Aortic valve implantation (TAVI): state of the art 2015. *Curr Heart Fail.* 2015; 12: 379–388.
28. Wrobel K., Stevens S.R., Jones R.H., et al.: Influence of baseline characteristics, operative conduct, and postoperative course on 30-day outcomes of coronary artery bypass grafting among patients with left ventricular dysfunction: results from the Surgical Treatment for Ischemic Heart Failure (STICH) Trial. *Circulation.* 2015; 132: 720–730.
29. Ozierański K., Kapłon-Cieślicka A., Peller M., et al.: Clinical characteristics and predictors of one-year outcome of heart failure patients with atrial fibrillation compared to heart failure patients in sinus rhythm. *Kardiol Pol.* 2016; 74 (3): 251–261. doi: 10.5603/KP.a2015.0180. Epub 2015 Sep 14.
30. Kowalczyk E., Kasprzak J.D., Lipiec P.: Heart failure as an independent predictor of thrombus persistence in nonvalvular atrial fibrillation: a transesophageal echocardiography-based study. *Pol Arch Med Wewn.* 2015; 125: 358–362.
31. Macchia A., Rodriguez Moncalvo J.J., Kleinert M., et al.: Unrecognised ventricular dysfunction in COPD. *Eur Respir J.* 2012; 39: 51–58.
32. Ueda R., Yokouchi M., Suzuki T., et al.: Prognostic value of high plasma brain natriuretic peptide concentrations in very elderly persons. *Am J Med.* 2003; 114: 266–270.
33. Maisel A.S., Krishnaswamy P., Nowal R., et al.: Rapid measurement of B-type natriuretic peptide in the emergency diagnosis of heart failure. *N Engl J Med.* 2002; 347 (3): 161–167.
34. Thygesen K., Mair J., Mueller C., et al.: Study group on biomarkers in cardiology of the ESC working group on acute cardiac care. *Eur Heart J.* 2012; 33: 2001–2006.
35. Springer J., Anker S.D.: Publication trends in cachexia and sarcopenia in elderly heart failure patients. *Wien Klin Wochenschr.* 2016, 128 (Suppl 7): 446–454.
36. Oga E.A., Eseyin O.R.: The Obesity paradox and heart failure: A systematic review of a decade of evidence. *J Obes.* 2016; 2016: 9040248. doi: 10.1155/2016/9040248. Epub 2016 Jan 20.
37. Amundson D.E., Djurkovic S., Matwiyoff G.N.: The obesity paradox. *Crit Care Clin.* 2010 Oct; 26 (4): 583–596. doi: 10.1016/j.ccc.2010.06.004.
38. Mangoni A.A.: Cardiovascular drug therapy in elderly patients: specific age-related pharmacokinetic, pharmacodynamics and therapeutic considerations. *Drugs Aging.* 2005; 22 (11): 913–941.
39. Maison P., Cunin P., Hemery F., et al.: Utilisation of medications recommended for chronic heart failure and the relationship with annual hospitalization duration in patients over 75 years of age. A pharmacoepidemiological study. *Eur J Clin Pharmacol.* 2005; 61: 445–451.
40. Shi S., Morike K., Klotz U.: The clinical implications of ageing for rational drug therapy. *Eur J Pharmacol.* 2008; 64: 183–199.
41. Lavan A.H., Gallagher P.: Predicting risk of adverse drug reactions in older adults. *Ther Adv Drug Saf.* 2016; 7 (1): 11–22.

42. Maher R.L., Hanlon J.T., Hajjar E.R.: Clinical consequences of polypharmacy in the elderly. *Expert Opin Drug Saf.* 2014; 13 (1): 57–65.
43. Martinez-Selles M.: End-stage heart disease in the elderly. *Revista Española de Cardiología English edition. Rev Esp Cardiol.* 2009; 62 (4): 409–421.
44. Forman D.E., Rich M.W.: Heart failure in the elderly. 2003. Medscape; http://www.medscape.com/viewarticle/465715_10 Accessed July 1, 2016. *Congest Heart Fail.* 2003 Nov–Dec; 9 (6): 311–321; discussion 309–310; quiz 322–323. Review.
45. Goodlin S.J.: Palliative care in congestive heart failure. *J Am Coll Cardiol.* 2009; 54: 386–396.
46. Kristjanson L.J., Aoun S.: Palliative care for families: remembering the hidden patients. *Can J Psychiatr.* 2004; 49 (6): 359–365.
47. Skrzypek A., Górski S., Wilczyńska-Golonka M., Nessler J.: Prognostic factors of left ventricle function deterioration in patients with coronary disease and normal results of echocardiographic examination in a 2-year observation—prospective cohort study. *Folia Med Crac.* 2016; 56 (3): 67–78.
48. Hawkins N.M., Petrie M.C., Jhund P.S., et al.: Heart failure and chronic obstructive pulmonary disease: diagnostic pitfalls and epidemiology. *Eur J Heart Fail.* 2009; 11: 130–139.