

Heart failure, comorbidities, and polypharmacy among elderly nursing home residents

Cyprian Michalik¹, Paweł Matusik¹, Jan Nowak¹, Katarzyna Chmielowska¹, Krzysztof A. Tomaszewski^{1,2}, Agnieszka Parnicka³, Marzena Dubiel³, Jerzy Gąsowski³, Tomasz Grodzicki³

¹ Jagiellonian University Medical College, Kraków, Poland

² Department of Anatomy, Jagiellonian University Medical College, Kraków, Poland

³ Department of Internal Medicine and Gerontology, Jagiellonian University Medical College, Kraków, Poland

KEYWORDS

comorbidities, elderly patients, heart failure, nursing homes, polypharmacy

ABSTRACT

INTRODUCTION Heart failure (HF) in the elderly is frequently associated with limited therapeutic options and may cause severe complications. Unfortunately, these patients are often excluded from clinical trials.

OBJECTIVES The aim of the study was to determine the relationship between HF, coexisting diseases, and use of medications in patients of advanced age living in nursing homes.

PATIENTS AND METHODS The study group included 79 women and 21 men between 65 and 102 years of age living in 2 nursing homes. Information about the health status of patients was gathered from history and medical records. We conducted a physical examination and, in eligible cases, also an orthostatic test. Comorbidity was assessed using the age-adjusted Charlson comorbidity index (ACCI).

RESULTS The prevalence of HF was 26%. The number of chronic diseases coexisting with HF was remarkably higher than the number of diseases among patients without HF (median, 6 [0–11] vs. 3 [0–8]; $P < 0.0001$). The ACCI was also higher in the HF group compared with patients without HF (median, 7 [5–12] vs. 5.5 [2–9]; $P < 0.0001$). Patients with HF took significantly more medications, although HF was treated according to the current guidelines in less than half of the cases.

CONCLUSIONS Our data revealed that HF is associated with significant morbidity and polypharmacy. There is a need for further research that would guide therapy of HF in elderly patients with limited life expectancy and multiple comorbidities as inhabitants of nursing homes. Nonetheless, the current treatment of nursing home patients with HF seems to be suboptimal.

INTRODUCTION Heart failure (HF) in elderly patients is a serious medical, social, and economic challenge. It is estimated that as many as 1 million people suffer from HF in Poland.¹ The prevalence of HF rises with age and reaches from 10% to 20% among 70- and 80-year-olds. In the developed countries, the mean age of patients with HF is 75 years.² At the same time, HF is the most common reason for hospitalization of people over 65 years of age,³ and approximately 2% of the healthcare costs is spent on the treatment of HF.⁴

At the end of 2009, there were more than 5.1 million people (13.5% of the population) over 65 years of age in Poland.⁵ This age group continues to grow, and in 2030 the percentage may nearly double, reaching 23.8%.⁶ A growing number of

elderly patients live in nursing homes. Between 2000 and 2009, the number of nursing home residents doubled and reached 11,310.⁷ Patients over 65 years of age require a high degree of physician involvement, irrespective of the setting (for example, in long-term care facilities, hospitals, and as outpatients).⁸ Unfortunately, such patients are frequently excluded from clinical trials. This leads to undue extrapolations of therapeutic recommendations yielded by trials performed in younger patients.⁹

Numerous conditions, such as arterial hypertension, coronary artery disease, renal and liver failure, often co-occur with HF, which leads to multiple drug use.^{3,10,11} This is likely to limit future therapeutic options (for example, in

Correspondence to:

Prof. Tomasz Grodzicki, MD, PhD,
Katedra Chorób Wewnętrznych
i Gerontologii, Uniwersytet
Jagielloński, Collegium Medicum,
ul. Śniadeckich 10, 31-531 Kraków,
Poland; phone: +48-12-424-88-00,
fax: +48-12-424-88-54,
e-mail: tomekg@su.krakow.pl

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TABLE 1 Basic characteristics of the study group; comparison of patients with and without heart failure

Variable	Residents without HF (n = 74)	Residents with HF (n = 26)	P
age, y	81.9 ± 8.3	85.7 ± 8.4	0.17
women	56 (76)	23 (89)	0.34
arterial hypertension	49 (66)	24 (92)	0.01
ischemic heart disease	29 (39)	18 (69)	0.0083
renal failure	2 (3)	6 (23)	0.0405
myocardial infarction	6 (8)	4 (15)	0.64
TIA or stroke	16 (22)	4 (15)	0.69
diabetes	15 (20)	6 (24)	0.98
frailty syndrome	60 (81)	18 (69)	0.2
hip fracture	8 (11)	5 (19)	0.448
osteoporosis	2 (3)	5 (19)	0.017
osteoarthritis	6 (8)	8 (39)	0.011
ACCI	5.5 (2–9)	7 (5–12)	<0.0001

Data are presented as mean ± standard deviation, number (percentage), or median (range).

Abbreviations: ACCI – age-adjusted Charlson Comorbidity Index, HF – heart failure, TIA – transient ischemic attack

new-onset diseases). Likewise, drug–drug interactions may interfere with drug efficacy, often in unpredictable ways. Other, rarely mentioned concomitant conditions, especially among people of advanced age, are frailty syndrome (FS), dementia, and orthostatic hypotension (OH). OH is present in more than 15% of the patients over 65 years of age.^{12,13}

Conditions such as OH, FS, and cognitive impairment increase the risk of falls, which are the most important cause of hip fracture among the elderly that in turn causes immobilization, increased morbidity, and mortality.¹⁴

The aim of the study was to determine the relationship between HF, comorbidities, and use of medications in patients of advanced age living in nursing homes.

PATIENTS AND METHODS The inclusion criteria and methods have been described in detail elsewhere.¹⁵ Briefly, we examined the residents of 2 nursing homes located in the Małopolska province in southern Poland, aged 65 years and over, who gave consent to participate in the study. Data on patients' health, including the reasons for immobilization (together with a history of hip fracture), coexistent conditions, and medication use, were gathered from medical records and history. The diagnosis of HF was based on medical records. It was confirmed by echocardiography results if available in the nursing home records (ejection fraction ≤50% and/or diastolic dysfunction). We conducted a routine physical examination, and also an orthostatic test in eligible patients (not wheelchair-bound or bed-ridden).

OH was defined as a decrease in systolic blood pressure by ≥20 mmHg and/or diastolic blood pressure by ≥10 mmHg during 3 minutes after standing up from the supine position (measurements were performed after 1 and 3 minutes).¹⁶

To assess comorbidity, we used the age-adjusted Charlson Comorbidity Index (ACCI).^{17,18}

Statistical analysis The database management and statistical analyses were performed with Statistica 9.0 PL (StatSoft, Tulsa, United States). The age is shown as mean ± standard deviation (SD), while other variables are presented as mean values ± SD or medians, according to the normal or nonnormal distribution of data. To give a more accurate description of the patients, we also assessed percentages and ranges. We compared the variables with normal distribution between HF and non-HF patients using the *t* test, while the proportions were calculated with the Pearson's χ^2 test. The data on ordinal scale/nonnormal distribution were compared with the Mann-Whitney *U* test. We used a 2-tailed *P* < 0.05 as a cut-off for statistical significance.

RESULTS The mean age of 79 women and 21 men was 82.9 ± 8.5 years (range, 65–102).

HF was identified in 26% of the patients (23 women and 3 men). The age of the patients with HF did not differ from that of the patients without HF (TABLE 1).

Overall, the coexisting conditions such as renal failure, arrhythmia, osteoarthritis, and osteoporosis were present more frequently in patients with HF (TABLE 1). Of these, arterial hypertension was found in 73% of the patients (n = 73) and ischemic heart disease in 47% (n = 47) (TABLE 1). However, no significant differences between the HF and non-HF groups were observed in the prevalence of diabetes, previous transient ischemic attacks or stroke, or a history of hip fracture.

The number of chronic comorbidities was higher in patients with HF than in the non-HF group (median, 6; range, 0–11 and median, 3; range, 0–8;

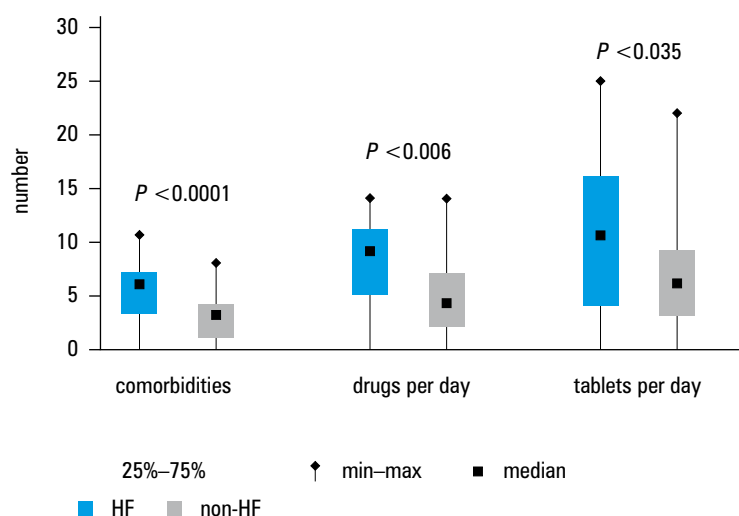


FIGURE Number of comorbidities, drugs, and tablets administered daily to residents with and without heart failure (HF)

respectively; $P < 0.0001$; **FIGURE**). Likewise, the ACCI was higher in the HF group than in the non-HF group ($P < 0.0001$, **TABLE 1**).

Both the number of medications (HF, median: 9, range: 0–14 vs. non-HF, median: 4, range: 0–14; $P = 0.006$) (**FIGURE**), and tablets (HF, median: 10.5, range: 0–25 vs. non-HF, median: 6, range: 0–22; $P = 0.035$) used daily were greater in HF compared with non-HF patients (**FIGURE**). Of the patients with HF, 77% took 5 or more medications regularly compared with 47% among non-HF patients ($P = 0.012$). Of the HF group, 62% took more than 10 tablets per day compared with 30% in the non-HF group ($P = 0.006$). Data on medication use are given in **TABLE 2**.

We diagnosed OH in 13 of 38 patients eligible for the orthostatic test (12 with HF and 26 without HF). There was no difference in the presence of OH between the groups.

DISCUSSION We observed HF in more than 25% of nursing home residents. Patients with HF have on average twice as many comorbidities as those without HF. The ACCI is significantly higher in the HF group. In particular, we observed that residents with HF more frequently suffer from such conditions as arterial hypertension, ischemic heart disease, and renal failure. Moreover, they take many more medications than patients without HF, so they are more burdened

not only by coexisting conditions but also by pharmacotherapy.

Widespread arterial hypertension and ischemic heart disease in nursing home residents should be noted. Hypertension turned out to be the most common condition in the entire group (73%) and occurred in 92% of the patients with HF, which is higher than the prevalence observed in a large Polish survey of patients with HF, where hypertension was detected in 67% to 85% of the patients with HF (mean age, >65 years).¹⁹ The IMPROVEMENT study reported hypertension in 47% of the patients with HF; however, the authors did not present the results in the age subgroups making direct comparisons unfeasible.²⁰ Patients in both large-scale surveys were mostly community dwellers. This underlines the fact that HF together with hypertension that predisposes to its development may be largely responsible for functional impairment warranting eligibility for long-term institutionalized care. Ischemic heart disease was the second most common condition and was also found significantly more often in the HF group (69%). The National Project of Prevention and Treatment of Cardiovascular Diseases (POLKARD) showed a similar prevalence of ischemic heart disease in patients with HF.²¹ It also showed a significant association between age and diagnostic or therapeutic methods used in this patient group.²¹

Younger patients are more frequently treated in accordance with the guidelines. Among hospitalized patients aged 80 and over, angiotensin-converting enzyme inhibitors (ACEIs) were taken by 81.9%, β -blockers by 61.5%, while ACEIs or angiotensin receptor blocker (ARB) and a β -blocker by 52.7%.²¹ A similar need for a more optimal management was also found in patients with hypercholesterolemia or in HF patients with coexisting atrial fibrillation.^{22,23} In our study, ACEIs were used only by 62% of the patients with HF, ARB only by 4%, while β -blockers by 62%. β -blockers along with ACEIs or ARBs were taken by 46% of the subjects. According to the current guidelines,²⁴ ACEIs and β -blockers are the mainstay of medical therapy in patients with HF. Thus, such discrepancies may result from the fact that the high level of comorbidity renders greater percentages of patients intolerant to ACEIs, ARBs, or β -blockers.

TABLE 2 Pharmacotherapy in patients with and without heart failure

Medications, n (%)	Residents without HF (n = 74)	Residents with HF (n = 26)	P
ACEI	28 (38)	16 (62)	0.04
ARB	2 (3)	1 (4)	0.71
β -blocker	29 (39)	16 (62)	0.05
ACEI/ARB + β -blocker	15 (20)	12 (46)	0.011
cardiac glycosides	3 (4)	3 (12)	0.37
diuretics	36 (49)	21 (81)	0.009
nitrates	13 (18)	1 (4)	0.16

Abbreviations: ACEI – angiotensin-converting enzyme inhibitor, ARB – angiotensin receptor blocker, others – see **TABLE 1**

However, intolerance to these medications was not assessed in the current study. Additionally, no clinical trial in HF patients included patients who were institutionalized and/or affected by numerous comorbidities and thus no data are available to guide therapy of HF in such groups of patients.

In our study, OH was found in about one-third of the eligible patients, which is in line with the results obtained from a home-dwelling population aged 75 years and more.¹³ On the other hand, we found OH to be twice as frequent as in the Cardiovascular Health Study.¹² This can be related to the specificity of the studied nursing home residents of advanced age. Such patients are suffering from a considerable number of chronic illnesses (3.8 on average), the prevalence of FS and dementia reaches 80%,^{15,25} and annual mortality is 28%.²⁶ Unexpectedly, there was no relationship between the presence of HF and OH.

Among elderly patients, especially nursing home residents, therapeutic difficulties can be exacerbated by widespread FS related to aging (which has been found for example to be associated with a negative outcome after non ST-segment elevation myocardial infarction),²⁷ cognitive impairment, and degenerative disorders,²⁸ which can lead to reduced functional ability and, through ignoring medical guidelines, lower treatment efficacy, and therefore further complicate challenging HF prognosis.²⁹ Other causes of suboptimal management of elderly patients with HF and suggestions for future improvements have been described in detail elsewhere.²¹

Our study has several limitations. Data, including HF diagnosis, were gathered on the basis of medical documentation. In this group, as reported previously, the high prevalence of cognitive impairment and FS (as high as 80% of patients) could have affected the diagnosis. Similarly, the size of our group and especially the proportion of patients eligible for the orthostatic test were modest, which may in some instances account for the lack of statistical significance. It also precluded the adjustment of our results for possibly confounding factors. On the other hand, to the best of our knowledge, this is one of a few studies that specifically addressed the issue of HF and its relations to comorbidities and polypharmacy in the nursing home setting.

Currently, every sixth person and nearly every second hospitalized patient in Poland is in advanced age. The increasing numbers of these patients will become the inhabitants of nursing homes.⁸ Our data indicate the need for further research, including clinical trials, which would guide therapy of HF in the elderly inhabitants of nursing homes. These trials should focus on both standard treatments recommended by the current HF guidelines, based on studies performed mainly on younger, healthier subjects as well as new therapeutic approaches to disorders commonly coexisting with HF among elderly patients, such as FS and dementia. Given the role of the immune system,³⁰ oxidative stress,³¹⁻³³ or 25-hydroxyvitamin

D deficiency³⁴ in the pathogenesis of FS and several forms of cognitive impairment, approaches to those targets should be further considered.

HF is a common condition in patients of advanced age who live in nursing homes. It occurs with a large number of comorbidities, which requires multi-drug therapies, causes difficulty in making therapeutic decisions, and may be a source of serious complications. The increasing number of patients requiring an institutional treatment indicates the need for prospective studies on the management of HF in elderly patients. Nonetheless, the current treatment of nursing home patients with HF seems to be suboptimal.

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Niewydolność serca, choroby towarzyszące i polipragmazja u osób w podeszłym wieku mieszkających w domach opieki

Cyprian Michalik¹, Paweł Matusik¹, Jan Nowak¹, Katarzyna Chmielowska¹, Krzysztof A. Tomaszewski¹, Agnieszka Parnicka², Marzena Dubiel², Jerzy Gąsowski², Tomasz Grodzicki²

¹ Uniwersytet Jagielloński, Collegium Medicum, Kraków

² Katedra Anatomii, Uniwersytet Jagielloński, Collegium Medicum, Kraków

³ Katedra Chorób Wewnętrznych i Gerontologii, Uniwersytet Jagielloński, Collegium Medicum, Kraków

SŁOWA KLUCZOWE

domy opieki,
niewydolność serca,
osoby w podeszłym
wieku, polipragmazja,
wielochorobowość

STRESZCZENIE

WPROWADZENIE Niewydolność serca (*heart failure* – HF) u osób starszych często jest związana z ograniczeniami terapeutycznymi i może być przyczyną ciężkich powikłań. Niestety osoby w podeszłym wieku są często wykluczane z badań klinicznych.

CELE Celem badania było określenie związku między HF, chorobami towarzyszącymi oraz lekami stosowanymi u osób w podeszłym wieku mieszkających w domach opieki.

PACJENCI I METODY W badanej grupie znalazło się 79 kobiet i 21 mężczyzn w wieku 65–102 lat mieszkających w dwóch domach opieki. Informacje dotyczące stanu zdrowia pacjentów zostały zebrane na podstawie wywiadu oraz dokumentacji medycznej. Przeprowadziliśmy badanie fizykalne, a u pacjentów kwalifikujących się również próbę ortostatyczną. Wielochorobowość oceniliśmy przy pomocy indeksu Charlsona z uwzględnieniem wieku (*age-adjusted Charlson comorbidity index* – ACCI).

WYNIKI HF występowała u 26% chorych. Liczba chorób towarzyszących HF była znacząco większa niż liczba chorób u chorych bez niewydolności serca (mediana: 6 [0–11] vs 3 [0–8]; $p < 0,0001$). ACCI również był większy w grupie chorych z niewydolnością serca w porównaniu z grupą bez niewydolności serca (mediana: 7 [5–12] vs 5,5 [2–9]; $p < 0,0001$). Chorzy z HF przyjmowali więcej leków, chociaż HF była leczona zgodnie z wytycznymi w mniej niż połowie przypadków.

WNIOSKI Prezentowane przez nas dane pokazują, że HF u osób w podeszłym wieku związana jest z istotną chorobowością oraz polipragmazją. Jednocześnie potrzebne są dalsze badania, które dadzą odpowiedź na pytanie jak leczyć HF u starszych pacjentów z ograniczoną przewidywaną dalszą długością życia i licznymi chorobami współistniejącymi, jak mieszkańcy domów opieki. Niemniej jednak obecne leczenie HF u mieszkańców domów opieki wydaje się suboptymalne.

Adres do korespondencji:
prof. dr hab. Tomasz Grodzicki,
Uniwersytet Jagielloński, Collegium
Medicum, Katedra Chorób
Wewnętrznych i Gerontologii,
ul. Śniadeckich 10, 31-531 Kraków,
tel.: 12-424-88-00, fax: 12-424-88-54,
e-mail: tomekg@su.krakow.pl
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