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ORIGINAL ARTICLE

## Older age and a higher EHRA score allow higher levels of frailty syndrome to be predicted in patients with atrial fibrillation

Agnieszka Mlynarska<sup>1</sup>, Rafal Mlynarski<sup>2</sup>, and Krzysztof S. Golba<sup>3</sup>

<sup>1</sup>Department of Internal Nursing, Chair of Internal Medicine, School of Health Sciences, Medical University of Silesia, Katowice, Poland, <sup>2</sup>Department of Electrophysiology, Upper Silesian Heart Center, Katowice, Poland, and <sup>3</sup>Department of Electrophysiology and Heart Failure, School of Health Sciences, Medical University of Silesia, Katowice, Poland

### Abstract

**Background:** There is no research that evaluates the relationship between the severity of the symptoms of atrial fibrillation (AF), the presence of frailty syndrome and acceptance of the illness.

**Methods:** The study included 132 patients aged  $72.7 \pm 6.73$  with diagnosed AF. The severity of the symptoms of AF was determined according to European Heart Rhythm Association (EHRA) guidelines, frailty syndrome was assessed using the Tilburg frailty indicator (TFI) and the acceptance of the illness was assessed using the acceptance of illness scale (AIS). A standard statistical comparison and multiple regression analysis using the stepwise method were performed.

**Results:** In patients with AF, frailty was  $5.31 \pm 2.69$  (TFI). Frailty syndrome was diagnosed in 59.8% of the AF patients who had a score of  $7.17 \pm 1.72$ . A higher level of EHRA score was connected with a smaller degree of the acceptance of the illness  $p = 0.0000$ . The multiple regression model indicated that age ( $p = 0.0009$ ) and the severity of the symptoms ( $p = 0.0001$ ) are important predictors of frailty syndrome.

**Conclusions:** There is a relationship between the presence of frailty syndrome and the intensity of the symptoms and the acceptance of AF. Age and the EHRA score permitted higher levels of frailty syndrome to be predicted.

### Keywords

Atrial fibrillation, frailty syndrome, EHRA score, acceptance of the illness

### History

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### Introduction

Atrial fibrillation (AF) is one of the biggest challenges associated with the treatment of cardiovascular diseases in modern countries. Unfavorable aspects of AF in the medical, social and economic fields will constantly deepen in the forthcoming decades. As the number of elderly people is increasing in general population, the incidences of AF will also increase significantly. Approximately 70% of patients who suffer from AF are between 60 and 85 years of age. Elderly patients that are diagnosed with AF have a higher risk of hospitalization and mortality compared to patients that do not suffer from AF. Epidemiological studies indicate that with increasing age, patients are more likely to be frail. Moreover, some studies have shown that patients with diagnosed cardiovascular diseases are particularly vulnerable to the occurrence of a number of adverse changes in homeostasis, which can then cause frailty syndrome. The exact relationship between frailty syndrome and AF is still the subject of

research. There are numerous hypotheses that have presented AF as a marker of frailty syndrome [1–5].

Frailty syndrome is one of the main problems of modern gerontology and is also an indicator of a poor prognosis. It is characterized by a decrease in resistance to acute stress and a lack of the body's physiological reserves. Frailty syndrome is significantly more common among patients with cardiovascular disease – 31% compared to 15% in those without cardiovascular disease (data according to research Cardiovascular Health Study 2004). Frailty syndrome is also one cause of the increase in the number of falls, hospitalizations and a worsening functioning in everyday life, which may result in the need for institutional care [6,7].

The acceptance of the illness plays an important role in the process of adapting to the disease and compliance to treatment. Acceptance of the illness is associated with accepting its occurrence and recognizing the limitations it causes. One of the determinants that affect the acceptance of illness is frailty syndrome [8].

The aim of the study was to evaluate the relationship between the severity of the symptoms of AF and the presence of frailty syndrome and to determine the impact of frailty on the acceptance of AF among patients.

Address for correspondence: Agnieszka Mlynarska, PhD, Department of Internal Nursing, Upper-Silesian Medical Centre, ul. Ziolowa 45/47, 40-635, Katowice, Poland. E-mail: [mlynarska83@gmail.com](mailto:mlynarska83@gmail.com)

## Methods

The study included 132 patients (59 women – 44.7%) hospitalized in the Electrophysiology Department in Katowice, Poland between 2015 and 2016 with a mean age of  $72.7 \pm 6.73$ . The main purpose of hospitalization was arrhythmias, and in all, different types of AF were recognized. In 56 of them (42.4%), electrical or pharmacological cardioversion was considered and in 83.9% patients, it was successful. Patients were divided into two subgroups according to age – 60–69 and  $\geq 70$ . In all of the patients included in the study, patients underwent a physical examination, the severity of symptoms of AF was determined according to the European Heart Rhythm Association (EHRA), frailty syndrome was assessed using the Tilburg frailty indicator (TFI) and acceptance of illness was assessed using the acceptance of illness scale (AIS) questionnaire.

A score of 1 in the EHRA means no symptoms and a score of 4 means symptoms that can limit daily functioning. The TFI consists of two parts – the first part concerns the determinants of frailty syndrome, while the second contains 15 questions that relate to the main components of frailty. The minimum number of points is 0 and the maximum is 15 points. Having 5 or more points indicates that a patient has frailty syndrome [5,9]. In addition, the acceptance of illness in all of the patients was assessed using the AIS questionnaire [10].

All of the patients included in the study were assigned to a group according to the type of AF that was diagnosed according to the guidelines of the European Society of Cardiology (ESC) [5]:

First diagnosed AF – patients who present with AF for the first time, irrespective of the duration of the arrhythmia or the presence and severity of symptoms.

Paroxysmal AF – self-terminating, which may last for up to 7 d.

Persistent AF – an AF episode lasts longer than 7 d or requires termination by cardioversion.

Long-standing persistent AF – an AF episode lasts for  $\geq 1$  year.

Permanent AF – exists when the presence of the arrhythmia is accepted by the patient and their physician.

## Statistical analysis

The data obtained were analyzed statistically and values were treated as significant when  $p < 0.05$ . The results obtained from the frailty syndrome evaluation using the TFI and the assessment of the acceptance of the disease using the AIS resulted in an arithmetic mean with the corresponding standard deviation. The Student's *t*-test was used to compare the quantitative data with a normal distribution and the Chi-square test was used for the non-parametric data. The Kruskal–Wallis was used to compare the values for more than two groups. The Pearson correlation coefficient *r* was used to correlate the AIS with the level of frailty.

In order to assess whether the analyzed parameters were predictors of the dependent variables, multiple regression analysis using the stepwise method was used. All calculations were performed using the Polish version of Statistica (StatSoft Inc., Tulsa, OK).

## Results

The characteristics of the patients that were included in the study are presented in Table 1. The patients with AF that were included in the study had an average value of frailty on the TFI scale of  $5.31 \pm 2.69$ . Patients in the under-70 age group had an average value of the TFI scale of  $4.00 \pm 2.64$  compared to patients 70 years or older who had a score of  $5.86 \pm 2.54$  – the difference between the groups was highly statistical ( $p = 0.0003$ ). Frailty syndrome was diagnosed in 59.8% of the patients with AF; the average score on the TFI among the patients that were diagnosed with frailty syndrome was  $7.17 \pm 1.72$ .

The analysis of the occurrence of frailty depending on the type of AF using the ESC indicated that there were no significant statistical differences in the recognition of frailty syndrome and the type of AF;  $p = 0.0858$ . Details are shown in Figure 1. The prevalence of frailty syndrome, depending on the reported symptoms and the classification by EHRA, was also analyzed. In patients without symptoms, in EHRA I, frailty syndrome was diagnosed in 25.0% of patients. In EHRA II, it was diagnosed in 53.6% of patients; in EHRA III – 66.0% and in EHRA IV – 90.9% of patients;  $p = 0.0069$ . Frailty syndrome was recognized most frequently among patients with severe symptoms of AF – EHRA IV. The mean values of the level of frailty, depending on the severity of symptoms indicated by the EHRA score are presented in Table 2.

The average results of the acceptance of illness for all of the patients included in the study was  $28.29 \pm 7.25$ , for women it was  $27.07 \pm 7.25$  compared to  $29.27 \pm 5.87$  for men;  $p = 0.0819$ . An evaluation of the impact of the assessment of the symptoms of AF using the EHRA on the degree of the acceptance of the disease showed that more severe symptoms and a higher level in the EHRA were connected with a smaller degree of acceptance of illness. The degree of the acceptance of the disease was for EHRA I –  $35.50 \pm 4.2$  versus EHRA II –  $31.28 \pm 5.2$  versus EHRA III –  $25.87 \pm 4.9$  versus EHRA IV –  $16.20 \pm 10.4$ ;  $p = 0.0000$ . Analysis of the Pearson correlation coefficient *r* between acceptance of illness and the severity of symptoms using the EHRA showed that the less severe the disease, the better the acceptance of illness ( $r = -0.6363$ ;  $p = 0.0001$ ).

Patients with frailty syndrome accepted the illness the least as compared to the robust patients ( $25.82 \pm 6.89$  versus  $31.85 \pm 6.23$ ;  $p = 0.0000$ ). The correlations between the level of frailty and the acceptance of the disease showed that the greater the number of points obtained in the evaluation of frailty and its components, the lower the acceptance of the illness:

- AIS versus global frailty:  $r = -0.5253$ ;  $p = 0.0001$
- AIS versus physical components:  $r = -0.4703$ ;  $p = 0.001$
- AIS versus psychological components:  $r = -0.2621$ ;  $p = 0.0024$
- AIS versus social components:  $r = -0.2488$ ;  $p = 0.0040$

The correlations between the AIS and frailty are shown graphically, in Figures 2–5.

Additionally, a multiple regression model using stepwise input method was performed. The predictors were age, the severity of the symptoms as determined using the EHRA,

Table 1. Characteristics of the patients included.

Factors	General	Robust	Frail	<i>p</i>
Age (years)	72.71 ± 6.73	70.76 ± 7.06	74.06 ± 6.17	<b>0.0051</b>
Gender (male)	55.3%	72.2%	43.59%	<b>0.0011</b>
Place of living (city in %)	85.61%	85.18%	85.89%	0.9092
Civil state				
Married	6.1%	3.7%	7.7%	0.3449
Widow/widower	38.6%	24.1%	48.7%	<b>0.0042</b>
Civil partnership	55.3%	72.2%	43.6%	<b>0.0011</b>
Education				
Basic	53.8%	42.8%	61.5%	<b>0.0104</b>
Secondary	37.9%	44.4%	33.3%	0.4884
Higher	8.3%	12.8%	5.2%	0.1093
Weight	80.68 ± 13.95	83.34 ± 16.07	78.78 ± 11.97	0.0694
Body mass index	29.15 ± 4.77	29.16 ± 4.67	29.14 ± 4.95	0.9799
Systolic blood pressure (mmHg)	128.51 ± 16.05	128.67 ± 16.40	128.39 ± 15.90	0.9249
Diastolic blood pressure (mmHg)	76.24 ± 8.61	78.04 ± 7.97	75.00 ± 8.86	<b>0.0459</b>
CHA <sub>2</sub> DS <sub>2</sub> -VASc	4.29 ± 1.63	3.81 ± 1.66	4.61 ± 1.53	<b>0.0050</b>
Heart rhythm (BPM)	81.79 ± 20.38	80.59 ± 20.84	82.62 ± 20.15	0.5765

CHA<sub>2</sub>DS<sub>2</sub>-VASc: score for atrial fibrillation stroke risk.  
Statistically significant values are highlighted in bold.

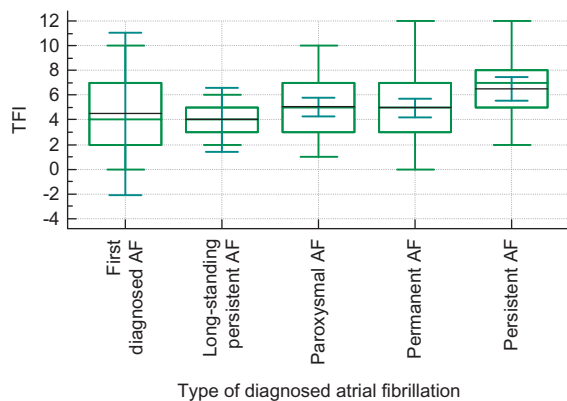


Figure 1. Recognition of frailty syndrome according to the type of atrial fibrillation. TFI: Tilburg frailty indicator.

heart rate, number of years of education and the presence of the risk factors for AF. The dependent variable was global frailty. The model was statistically significant and explained 36% of the observed variance in the dependent variable ( $p = 0.0001$ ,  $R^2 = 0.3621$ ). The analysis showed that age ( $p = 0.0009$ ) and the severity of symptoms as determined by the EHRA ( $p = 0.0001$ ) are important predictors of the dependent variable and permit higher levels of frailty syndrome to be predicted.

A multiple regression model in which the predictors were age, assessment of severity using the EHRA, heart rate, number of years of education of the patients and the risk factors for AF and the dependent variable was the physical component of frailty was statistically significant and explained 32% of the observed variance in the dependent variable ( $p = 0.0001$ ;  $R^2 = 0.3265$ ). The analysis showed that age ( $p = 0.0100$ ) and the severity of the symptoms as determined by the EHRA (0.0001) are important predictors of the dependent variable.

When the dependent variable was the psychological component of frailty, it was found that it was statistically significant and it explained 6% of the observed variance in the dependent variable ( $p = 0.0052$ ;  $R^2 = 0.05976$ ). The analysis

showed that the severity of the symptoms as determined by the EHRA is an important predictor of the dependent variable.

A multiple regression model using the same predictor with the social component of frailty as the dependent variable showed the statistical significance of the model and permitted 10% of the observed variance in the dependent variable to be explained ( $p = 0.0009$ ;  $R^2 = 0.1052$ ).

## Discussion

Although AF is the most common arrhythmia among the population, it occurs more often among elderly patients. The incidence of AF increases with age from <0.5% among people aged 40–50 years to 5–15% among people aged 80 years. AF is associated with an increased rate of mortality and complications such as strokes, thromboembolic events, heart failure and a reduction in functional capacity [1,3,5].

An important factor that can contribute to an improvement in the prognosis and functioning of patients with AF is their acceptance of the disease. According to Bergman et al., AF may be a marker of frailty syndrome. In addition, older people who are diagnosed with frailty syndrome are characterized by more complex clinical and functional limitations as well as cognitive abilities. AF can be considered to be an indicator of an individual's functional status [11–13].

The relationship between symptoms and cardiac arrhythmias has an influence on somatic and psychological factors. The EHRA proposed a classification of the symptoms of patients and their impact on normal daily activities [5]. In our study, patients with stronger and more common symptoms that limited their daily functioning were significantly more likely to have a diagnosis of frailty syndrome. The EHRA scale was a significant predictor of frailty syndrome and its components in the multiple regression analysis. Freeman et al. attempted to assess the relationship between the intensity of the symptoms of AF and quality of life using the EHRA. They showed that patients with a higher class of EHRA evaluated their quality of life as being significantly worse. They also had a higher incidence of AF symptoms such as palpitations,

Table 2. Average frailty values according to the EHRA score.

Frailty	EHRA I	EHRA II	EHRA III	EHRA IV	<i>p</i> Kruskal–Wallis
Global frailty	$1.83 \pm 1.11$	$4.66 \pm 2.54$	$6.21 \pm 2.12$	$8.09 \pm 2.30$	0.0000
Physical frailty	$0.83 \pm 0.72$	$2.62 \pm 1.81$	$3.83 \pm 1.67$	$5.18 \pm 1.25$	0.0000
Psychological frailty	$0.33 \pm 0.65$	$1.32 \pm 1.04$	$1.36 \pm 0.94$	$1.64 \pm 1.29$	0.0052
Social frailty	$0.66 \pm 0.78$	$0.71 \pm 0.95$	$1.02 \pm 0.91$	$1.27 \pm 0.90$	0.0789

EHRA: European Heart Rhythm Association.

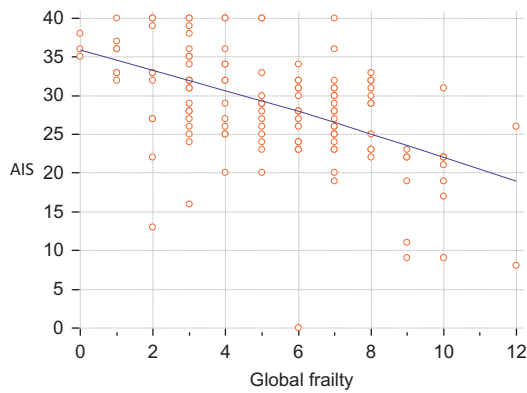


Figure 2. Correlation between the AIS and global frailty. AIS: acceptance of illness scale.

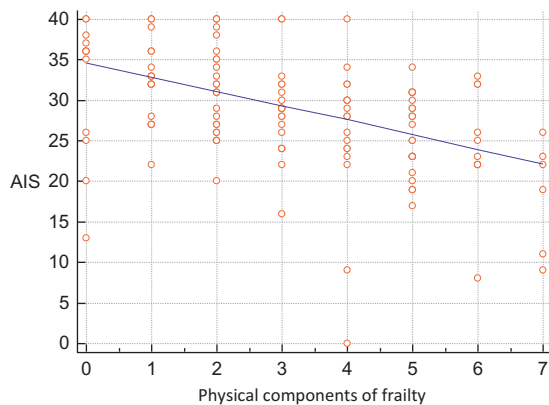


Figure 3. Correlation between the AIS and the physical components of frailty. AIS: acceptance of illness scale.

shortness of breath, fatigue and headache. The severity of the symptoms and their number undoubtedly affected the assessment of the acceptance of the disease when assessing daily functioning [14,15].

Several studies conducted among patients with AF that evaluate the occurrence of frailty syndrome include the overall consideration of anticoagulant therapy and the implications of frailty on its effectiveness. In our study, all of the patients included in the study received vitamin K antagonists when the AF was not recognized for first time. Patients with frailty syndrome had a significantly higher risk of thromboembolic events compared to patients without frailty syndrome [16,17]. Polidro et al. and Serale et al. showed that AF is associated with the occurrence of frailty syndrome, regardless of gender, age or comorbidities [18,19]. In the Pro.V.A study, a statistically significant relationship between AF and

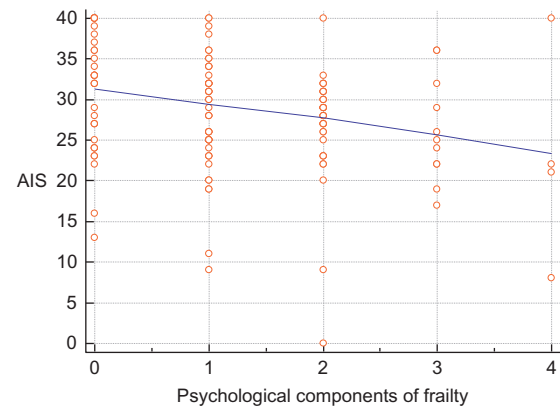


Figure 4. Correlation between the AIS and the psychological components of frailty. AIS: acceptance of illness scale.

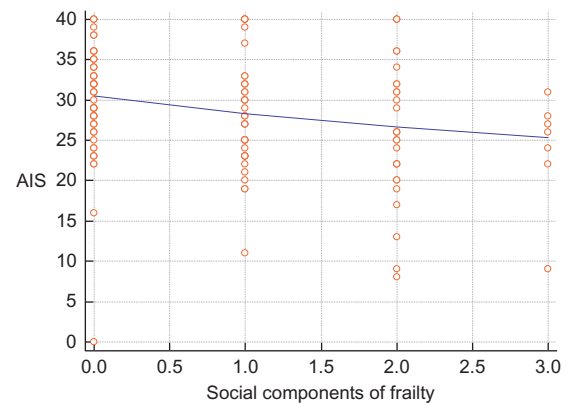


Figure 5. Correlation between the AIS and the social components of frailty. AIS: acceptance of illness scale.

disability was demonstrated. However, complex methods for the prevention and treatment of frailty syndrome have not yet been developed [20]. We believe that the results of our research are a small step toward developing them.

Lefebvre et al. suggested that it is necessary to consider the routine evaluation of frailty syndrome in elderly patients with AF. We need to better understand how frailty increases the risks and affects the benefits of the treatment of cardiovascular diseases including AF and then try to individualize the care of the elderly [16].

## Conclusions

There is a relationship between the presence of frailty syndrome and the intensity of the symptoms of AF as evaluated using the EHRA scale. A higher EHRA level is also connected with a worse acceptance of AF. It is suggested that



the simple EHRA scale should be used to routinely evaluate patients with AF because it can be a prognostic factor of the outcomes. The type of AF in our research did not influence the presence of frailty syndrome.

### Declaration of interest

No conflicts of interest for all authors.

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