ORIGINAL ARTICLE

# Psychometric evaluation of the Polish version of the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia: a new tool for symptom and health-related quality of life assessment

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**KEY WORDS**
arrhythmia, atrial fibrillation, health-related quality of life, psychometric evaluation, symptoms

**ABSTRACT**

**BACKGROUND** Atrial fibrillation (AF) is the most common arrhythmia resulting in hospitalization. The assessment of symptoms and health-related quality of life (HRQoL) can provide valuable information before, during, and after health care interventions for AF.

**AIMS** We aimed to perform a translation and cultural adaptation of the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia (ASTA), and to evaluate the reliability and validity of its Polish version.

**METHODS** The standard forward-backward translation procedure to translate the ASTA questionnaire into Polish was used. A total of 244 patients with AF at a mean (SD) age of 70.7 (10.7) years completed the questionnaire and were included in the study. Reliability was tested using internal consistency (Cronbach α) and validity with an item-total correlation, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA).

**RESULTS** The ASTA symptom scale had satisfactory psychometric properties (α = 0.718), and the corrected item-total correlation was sufficient for most items (0.361–0.506), except for cold sweats (0.156). The ASTA HRQoL scale showed good psychometric properties (α = 0.855). Initial CFA analyses showed that the 1- and 2-factor models had similar properties, with strong factor loadings and satisfactory goodness-of-fit values according to the comparative fit index (0.947 for the 1-factor model vs 0.988 for the 2-factor model). A comparison of the 1-and 2-factor models showed that the close fit for the root-mean-square error of approximation was better for the 2-factor model (0.387 vs 0.193). A 2-factor EFA model was produced, and for factor 1 (physical scale), the varimax low ranged between 0.470 and 0.804, and for factor 2 (the mental scale), it ranged between 0.597 and 0.873.

**CONCLUSIONS** The psychometric properties of the Polish version of the ASTA questionnaire were overall found to be satisfactory.

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## WHAT'S NEW?

The psychometric properties of the Polish version of the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia questionnaire were overall found to be satisfactory. This is a new specific tool for symptom and health-related quality of life (HRQoL) assessment. Symptom relief and increased HRQoL are goals in the care of patients with atrial fibrillation (AF). This must be evaluated on the basis of the patient's own experience. There is a need for the assessment of disease-specific patient-reported outcome measures, and these data can be used to evaluate the patient's situation related to AF during medical visits and to facilitate treatment planning. Identification of symptoms perceived as the most burdensome should be included in clinical practice as a standard in individual-centered care. Self-reported assessment of symptom burden and HRQoL constitutes a valuable contribution to clinical practice and research.

**INTRODUCTION** The available epidemiologic data indicate a constant increase in the number of patients diagnosed with atrial fibrillation (AF), especially in developed countries. The number of new AF cases is expected to double by 2050.[1] Although AF is not a life-threatening condition itself, the frequent occurrence of symptoms may affect the functioning of patients and significantly decrease their health-related quality of life (HRQoL).[2] The impact of arrhythmia on patients is often affected by the frequency, duration, and severity of disease-specific symptoms; particularly frequent attacks have been demonstrated to adversely affect the quality of life.[3,4]

As clinical indicators are no longer sufficient for the evaluation of treatment effectiveness, HRQoL assessment has been introduced into medical practice, building upon the World Health Organization definition of health as a state of physical, emotional, and social well-being, rather than the mere absence of disease.[5] The assessment of self-reported HRQoL or patient-reported outcome measures indicates the disease- and treatment-related limitations that patients experience in their daily life.[6]

In addition to clinical factors, the evaluation of symptom burden and treatment effectiveness should include the patient's self-assessment and the impact of the disease and treatment on their daily functioning.[7] The choice of appropriate HRQoL questionnaires in patients with AF is challenging. Most of the available HRQoL questionnaires are generic tools that do not include the disease-specific symptoms and their impact on the patient's functioning. There are a few scales that evaluate outcomes in arrhythmia, either including AF or developed for use in patients with other supraventricular arrhythmias.[8] The only other questionnaire recommended for patients with arrhythmias available in Polish is the Patient Perception of Arrhythmia Questionnaire.[9] Apart from minor problems related to the procedure of translating the naming of arrhythmias into Polish, the authors describe how the questionnaire was well received and understood by patients. Its advantage is the smaller number of questions compared with the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia (ASTA) questionnaire. Unfortunately, the authors did not conduct any psychometric evaluation of the Polish version of the tool, which limits the possibility of its use.[9]

The ASTA questionnaire is designed to assess both the arrhythmia-specific symptom burden and the impact of arrhythmias on the patient's HRQoL and daily functioning.[7,10] Prior to the present study, the questionnaire had not undergone any cultural adaptation to the Polish setting. Therefore, the aim of the study was to perform a translation and cultural adaptation of the ASTA questionnaire, and to evaluate the reliability and validity of its Polish version.

**METHODS** **Ethical considerations** The study was approved by the Bioethics Committee of Wroclaw Medical University (no. KB 53/2014). All patients provided their written informed consent to participate in the study. The study protocol was developed in accordance with the Declaration of Helsinki.[11]

**The ASTA questionnaire** The questionnaire has 3 components. Part I investigates arrhythmia experienced recently by the patient (with 8 answer variants) and the medication taken. Part II evaluates the severity of the 9 most common arrhythmia symptoms with the ASTA 9-item symptom scale, as well as their frequency and duration when recently experienced.[7,10] A global score for this part of the ASTA symptom scale can be calculated, with a maximum score of 27 points (where a higher score implies a higher symptom burden). Finally, part III evaluates the influence of arrhythmia on the patient's daily life, that is, HRQoL, and comprises 13 questions related to the impact of arrhythmia on daily physical (7 items) and mental function (6 items). The ASTA HRQoL total scale score ranges from 0 (best possible HRQoL) to 39 (worst possible HRQoL). Higher scores reflect a more negative impact of arrhythmia on the HRQoL.[10]

The sociodemographic and clinical data of patients were obtained from hospital records. The clinical analysis included information on the type of AF, European Heart Rhythm Association (EHRA) classification,[12] duration of illness, types and doses of medication, thromboembolic risk assessed using the $CHA_2DS_2VASc$ thromboembolic risk score (congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, history of stroke or thromboembolism, vascular disease, age 65 to 74 years, female sex), bleeding risk assessed using the HAS-BLED hemorrhage

risk score (hypertension, abnormal liver function, history of stroke or thromboembolism, history of bleeding, age ≥65 years, use of nonsteroidal anti-inflammatory drugs, and alcohol abuse), and any comorbidities.

**Translation and cross-cultural adaptation of the ASTA questionnaire** The adaptation of the questionnaire was performed using standard methodology.[13] The Polish adaptation is based on the English- and Swedish-language versions,[7,10] while the translation process was performed in collaboration with the authors of the ASTA questionnaire. The questionnaire was translated independently into Polish by 2 native Polish-speaking medical doctors working at the Department of Cardiology in Linköping. These translations were then evaluated by another native Polish-speaking person. The corrected version was discussed further with another native Polish-speaking medical doctor, a cardiologist. The ASTA Swedish and Polish versions were then sent to a translation agency for comments and suggestions. The version revised by the translation agency was discussed with a native Polish-speaking nurse, who provided some additional comments and suggestions on the translation. Finally, the ASTA Polish version was approved by a native Polish-speaking electrophysiologist. A panel of experts verified the phrasing and meaning of all questions, as well as the clarity and correctness of the instructions, with regard to the possible application of the questionnaire in Polish patients. The final Polish version, approved by the author of the original questionnaire, was verified in a pilot study conducted in a group of 15 patients with AF. The entire project was executed according to the Professional Society for Health Economics and Outcomes Research Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures published in 2005.[14]

**Participants** The study was performed between January 2015 and September 2016 at the Cardiology Department of the Marciniak Hospital in Wrocław, Poland. A total of 260 patients treated for AF in accordance with EHRA criteria[12] were recruited. Patients completed the questionnaire once, during a regular visit. The inclusion criteria were as follows: age of 18 years or older, lack of comorbidities involving severe hemodynamic instability, lack of cognitive impairment that could interfere with questionnaire completion, and fluency in written and spoken Polish. All participants provided written informed consent before completing the questionnaire. All patients were provided with written information regarding the study, including questionnaire completion and the voluntary nature of their participation, with the right to withdraw from the study at any time.

**Statistical analysis** Categorical variables were presented as numbers and percentages. Quantitative variables were presented as mean (SD) or median ($Q_1$; $Q_3$). The significance of differences between responses to the components of item 6, question 6 (Q6) in Part II (9-item symptom scale), was tested using the nonparametric repeated measures analysis of variance (Friedman test). The internal consistency of the Polish adaptation was assessed based on Cronbach alpha, and an α coefficient of 0.70 or higher was considered sufficient.

Construct validity was evaluated with item-total correlations adjusted for overlaps, and an acceptable level was set at a value of 0.30 or higher.[15] We used exploratory factor analysis with varimax rotation to assess the factor structure of the questionnaire. On the basis of principal content matrix, the questions in ASTA Part III were assigned to 1 of 2 separate groups. Furthermore, we used confirmatory factor analysis (CFA) to evaluate the hypothesized factor structure, including a physical and mental subscale. The first model was specified as the 1-factor model, and the second model was specified as the 2-factor model. In the 2-factor model, the factors were allowed to correlate freely. In this first step, no residual variances were allowed to correlate. Both models were thereafter respecified. Based on modification indices, residual variances were allowed to correlate. Other models, including cross-loadings between the 2 factors and the indicator variables, were also tested. As these models did not improve the fit between the model and data, they were not reported in this study. A robust weighted least square estimator in a diagonal weight matrix (WLSMV) was used in all CFAs, because the assumption of multivariate normality was violated and the indicator variables were categorical. To evaluate the goodness of fit between the models and data, we used fit indices suitable for WLSMV, including the $\chi^2$ goodness of fit, weighted root-mean-square residual, the root-mean-square error of approximation (RMSEA), close fit for RMSEA (CFit), comparative fit index (CFI), and the Tucker–Lewis index (TLI). A sufficient model fit was defined as nonsignificant $\chi^2$ goodness of fit and CFit, a weighted root-mean-square residual of less than 1.0, an RMSEA of 0.05 or less, and a CFI and TLI of 0.95 or greater. As the traditional $2^2$ difference test is not appropriate for WLSMV, we used the DIFFTEST command in Mplus to enable an evaluation of differences between the revival models. All goodness-of-fit indices were used to assess if the supposed measurement model fits the data. The STATISTICA v.12.5 software and its SEPATH module were used for validation (StatSoft, Inc., Tulsa, Oklahoma, United States).

**TABLE 1** Sociodemographic and clinical characteristics of patients with atrial fibrillation (n = 244)

| Parameter | | Value |
|---|---|---|
| Sex | Female | 138 (56.6) |
| | Male | 106 (43.4) |
| Age, y | Mean (SD) | 70.7 (10.7) |
| | Range (min – max) | 40–93 |
| Marital status | Married | 125 (51.2) |
| | Single (living alone) | 119 (48.8) |
| Education | Elementary school | 106 (43.4) |
| | High school | 81 (33.2) |
| | College or university | 57 (23.4) |
| Residence | Urban | 184 (75.4) |
| | Rural | 60 (24.6) |
| Professional activity | Employed | 59 (24.2) |
| | Retired | 185 (75.8) |
| Type of atrial fibrillation | Paroxysmal | 116 (47.5) |
| | Permanent / Persistent | 128 (52.5) |
| Duration of atrial fibrillation | <5 years | 146 (59.8) |
| | 5–10 years | 67 (27.5) |
| | >10 years | 31 (12.7) |
| Type of anticoagulant treatment | NOAC | 87 (35.7) |
| | VKA | 157 (64.3) |
| Number of all medication tablets taken daily | 1–5 | 103 (42.2) |
| | 6–10 | 114 (46.7) |
| | >10 | 27 (11.1) |
| EHRA classification | I | 32 (13.1) |
| | II | 67 (27.5) |
| | III | 74 (30.3) |
| | IV | 71 (29.1) |
| $CHA_2DS_2VASc$ | Mean (SD) | 3.76 (1.93) |
| | Median (Q1–Q3) | 4 (2–5) |
| HAS-BLED | Mean (SD) | 2.37 (1.24) |
| | Median (Q1–Q3) | 2 (2–3) |
| Comorbidities | Hypertension | 185 (75.8) |
| | Ischemic heart disease | 69 (28.3) |
| | Diabetes | 76 (31.1) |
| | Heart failure | 84 (34.4) |
| | Hyperthyroidism | 32 (13.1) |
| | No comorbidities | 6 (2.5) |

Data are presented as number (percentage) unless otherwise indicated.

EHRA classification of atrial fibrillation symptoms: I, no symptoms; II, mild symptoms; III, severe symptoms; IV, disabling symptoms

$CHA_2DS_2VASc$ thromboembolic risk score: congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, history of stroke or thromboembolism, vascular disease, age 65 to 74 years, female sex

HAS-BLED bleeding risk score: hypertension, abnormal liver function, history of stroke or thromboembolism, history of bleeding, age ≥65 years, use of nonsteroidal anti-inflammatory drugs, and alcohol abuse

Abbreviations: EHRA, European Heart Rhythm Association; NOAC, non–vitamin K antagonist oral anticoagulant; VKA, vitamin K antagonist

**TABLE 2** Patients providing responses in the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia Part I (n = 244)

| ASTA I – items | | Value |
|---|---|---|
| Q1. When did you last experience arrhythmia? | I have persistent arrhythmia. | 13 (5.3) |
| | I have arrhythmia on and off every day. | 29 (11.9) |
| | Less than a week ago | 124 (50.8) |
| | Less than 1 month ago | 36 (14.8) |
| | 1 month – less than 3 months ago | 7 (2.9) |
| | 3 months – less than 6 months ago | 19 (7.8) |
| | 6 months – less than 12 months ago | 9 (3.7) |
| | More than 12 months ago | 7 (2.9) |
| Q2. Are you currently on medication? | Yes | 244 (100) |

Data are presented as number (percentage).

**RESULTS** **Patient characteristics** Of the 260 patients recruited, 16 failed to complete the questionnaire or withdrew from the study without providing a reason. Ultimately, 244 patients, of whom 138 were women, at a mean (SD) age of 70.7 (10.7) (range, 40–93) years completed the questionnaire and were included in the study.

More than half of the patients (52.5%) had permanent AF, and nearly 59.8% had been diagnosed with AF within the previous 5 years. In accordance with the EHRA symptom severity classification, 27.5%, 30.3%, and 29.1% of patients were in classes II, III, and IV, respectively.[16] The mean $CHA_2DS_2VASc$ score was 3.76 (SD, 1.93), and the mean HAS-BLED score was 2.37 (SD, 1.24) (with a score of 3 or higher indicating high risk). The most common comorbidity was hypertension (75.8%). Data are shown in TABLE 1.

**ASTA Part I results** The responses to items 1 and 2 of the ASTA Part I questionnaire in the patient group are shown in TABLE 2. Approximately half of the patients (50.8%) had experienced arrhythmia symptoms within the preceding week, and 14.8%, within the preceding month; 11.9% of the patients said they experienced arrhythmia every day. All patients declared they were undergoing pharmacological treatment.

**ASTA Part II symptom scale scores** Responses to the ASTA 9-item symptom scale concerning symptom burden are shown in TABLE 3. A comparison of the scores in each component of item Q6 (Supplementary material, *Figure* S1) showed differences between the burden associated with the symptoms listed in the questionnaire ($P$ <0.001). The highest burden was associated with the following symptoms: Q6a (breathlessness during activity), Q6e (weakness / fatigue), Q6f (tiredness), Q6g (chest pain), and Q6i (worry / anxiety), and the lowest, with Q6b (breathlessness even at rest) and Q6d (cold sweats).

More than half of the patients (54.5%) experienced symptoms of arrhythmia at particular times (item Q5), for example, during sleep, stress, and physical activities. For item Q1, regarding the occurrence of arrhythmia within the preceding 3 months, most patients stated they had experienced symptoms fewer than 5 times (45.9%). For item Q2 ("How long does your arrhythmia normally last?"), most respondents stated that their arrhythmia symptoms usually lasted less than an hour (45.9%). For item Q3 ("What is the longest time for which your arrhythmia lasted?"), the longest time was shorter than 1 hour in 48.4% of the patients. For item Q4, describing the experience of palpitations ("Do you experience any of the following in connection with your arrhythmia?"), the most commonly reported complaints were "heart beating fast" (65.5%). Only 11.1% of the patients experienced no symptoms associated with the arrhythmia. For item Q6, patients chose the following rating for all symptoms except breathlessness at rest, dizziness, and cold sweats: "Yes, to a certain extent." Of the 244 patients, 41% had come close to fainting in connection with their arrhythmia (Q7), and 22.1% had fainted (Q8). Data are shown in TABLE 3.

**ASTA Part III health-related quality of life scores** The scores for items in ASTA Part III, the ASTA 13-item HRQoL scale, are shown in TABLE 4. Nearly half of the respondents (46.7%) stated they experienced difficulties in daily activities related to the arrhythmia "quite a lot." The respondents also said they spent "a lot" less time than they would like to with their relatives and friends (59%) and acquaintances (59.4%). Moreover, the arrhythmia largely restricted their ability to travel and perform leisure activities (42.2%) as well as to concentrate (54.1%). Moreover, it caused sleep problems (43.3%) and negatively affected their sexual

**TABLE 3** Patients providing responses in the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia Part II (n = 244)

| ASTA II arrhythmia-specific symptoms – items | | Value |
|---|---|---|
| Q1. How many times have you experienced arrhythmia during the last 3 months? | None | 36 (14.8) |
| | Less than 5 times | 112 (45.9) |
| | Between 5 and 15 times | 55 (22.5) |
| | Between 16 and 30 times | 14 (5.7) |
| | More than 30 times (but not every day) | 6 (2.5) |
| | I experience arrhythmia on and off every day. | 18 (7.4) |
| | I have persistent arrhythmia. | 3 (1.2) |
| Q2. For how long does your arrhythmia usually last? | Less than 1 hour | 112 (45.9) |
| | 1 hour – less than 7 hours | 55 (22.5) |
| | 7 hours – less than 24 hours | 14 (5.7) |
| | 24 hours – less than 2 days | 6 (2.5) |
| | 2 days – 7 days | 18 (7.4) |
| | More than 7 days | 3 (1.2) |
| Q3. What is the longest time for which your arrhythmia lasted? | Less than 1 hour | 118 (48.4) |
| | 1 hour – less than 7 hours | 69 (28.3) |
| | 7 hours – less than 24 hours | 44 (18.0) |
| | 24 hours – less than 2 days | 7 (2.9) |
| | 2 days – 7 days | 2 (0.8) |
| | More than 7 days | 4 (1.6) |
| Q4. Do you experience any of the following in connection with your arrhythmia? | My heart beats fast. | 160 (65.6) |
| | My heart beats regularly. | 7 (2.9) |
| | My heart beats irregularly. | 148 (60.7) |
| | My heart beats harder than usual. | 109 (44.7) |
| | A feeling that my heart is missing one or more beats. | 59 (24.2) |
| | Short episodes of arrhythmia lasting less than 1 minute | 34 (13.9) |
| | No, I do not experience any of the above. | 27 (11.1) |
| Q5. Does your arrhythmia occur at specific occasions? | No | 133 (54.5) |
| | Yes | 111 (45.5) |
| Q6. What symptoms do you experience in connection with your arrhythmia? median (Q1–Q3)[a] Yes, a lot; Yes, quite a lot; Yes, to a certain extent; No | a) Breathlessness during activity | 1 (0–2) |
| | b) Breathlessness even at rest | 0 (0–1) |
| | c) Dizziness | 0.5 (0–1.5) |
| | d) Cold sweats | 0 (0–1) |
| | e) Weakness / fatigue | 1 (0–2) |
| | f) Tiredness | 1 (0–2) |
| | g) Chest pain | 1 (0–2) |
| | h) Pressure / discomfort in chest | 1 (0–1) |
| | i) Worry / anxiety | 1 (0–2) |
| Total scores Q6, median (Q1–Q3) | | 7 (4–10.5) |
| Q7. Have you ever come close to fainting in connection with your arrhythmia? | No | 144 (59) |
| | Yes | 100 (41) |
| Q8. Have you ever fainted in connection with your arrhythmia? | No | 190 (77.9) |
| | Yes | 54 (22.1) |

Data are presented as number (percentage) unless otherwise indicated.

**a** The key to the score calculation in the Polish version of the ASTA questionnaire is available with the authors

**TABLE 4** Patient responses in the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia Part III (ASTA III) (continued on the next page)

| Items[a] | | Value |
|---|---|---|
| Q1. Do you feel unable to work, study, or carry out daily activities as you would like to due to your arrhythmia? | Median (Q1–Q3) | 1 (1–2) |
| | Yes, a lot | 56 (23) |
| | Yes, quite a lot | 114 (46.7) |
| | Yes, to a certain extent | 57 (23.4) |
| | No | 17 (7) |
| Q2. Do you spend less time with your family / relatives and friends than you would like to due to your arrhythmia? | Median (Q1–Q3) | 0 (0–1) |
| | Yes, a lot | 144 (59) |
| | Yes, quite a lot | 75 (30.7) |
| | Yes, to a certain extent | 22 (9) |
| | No | 3 (1.2) |
| Q3. Do you spend less time with acquaintances (people you do not know that well) than you would like to due to your arrhythmia? | Median (Q1–Q3) | 0 (0–1) |
| | Yes, a lot | 145 (59.4) |
| | Yes, quite a lot | 71 (29.1) |
| | Yes, to a certain extent | 19 (7.8) |
| | No | 9 (3.7) |
| Q4. Do you avoid planning things you would like to do, for instance travelling or leisure activities due to your arrhythmia? | Median (Q1–Q3) | 1 (0–2) |
| | Yes, a lot | 103 (42.2) |
| | Yes, quite a lot | 74 (30.3) |
| | Yes, to a certain extent | 46 (18.9) |
| | No | 21 (8.6) |
| Q5. Is your physical ability impaired due to your arrhythmia? | Median (Q1–Q3) | 1 (1–2) |
| | Yes, a lot | 48 (19.7) |
| | Yes, quite a lot | 83 (34) |
| | Yes, to a certain extent | 90 (36.9) |
| | No | 23 (9.4) |
| Q6. Is your ability to concentrate impaired due to your arrhythmia? | Median (Q1–Q3) | 0 (0–1) |
| | Yes, a lot | 132 (54.1) |
| | Yes, quite a lot | 59 (24.2) |
| | Yes, to a certain extent | 46 (19.9) |
| | No | 7 (2.9) |
| Q7. Do you feel dejected or sad due to your arrhythmia? | Median (Q1–Q3) | 1 (0–2) |
| | Yes, a lot | 69 (28.3) |
| | Yes, quite a lot | 100 (41) |
| | Yes, to a certain extent | 64 (26.2) |
| | No | 11 (4.5) |
| Q8. Do you feel irritated or angry due to your arrhythmia? | Median (Q1–Q3) | 1 (0–1) |
| | Yes, a lot | 82 (33.6) |
| | Yes, quite a lot | 127 (52.0) |
| | Yes, to a certain extent | 28 (11.5) |
| | No | 7 (2.9) |
| Q9. Do you experience sleep problems due to your arrhythmia? | Median (Q1–Q3) | 1 (0–2) |
| | Yes, a lot | 108 (44.3) |
| | Yes, quite a lot | 51 (20.9) |
| | Yes, to a certain extent | 68 (27.9) |
| | No | 17 (7) |

**TABLE 4** Patients providing responses in the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia Part III (ASTA III) (continued from the previous page)

| Items[a] | | Value |
|---|---|---|
| Q10. Is your sexual life affected negatively by your arrhythmia? | Median (Q1–Q3) | 0 (0–1) |
| | Yes, a lot | 167 (68.4) |
| | Yes, quite a lot | 42 (17.2) |
| | Yes, to a certain extent | 34 (13.9) |
| | No | 1 (0.4) |
| Q11. Are you afraid of dying due to your arrhythmia? | Median (Q1–Q3) | 1 (0–2) |
| | Yes, a lot | 64 (26.2) |
| | Yes, quite a lot | 99 (40.6) |
| | Yes, to a certain extent | 46 (18.9) |
| | No | 35 (14.3) |
| Q12. Has your life situation deteriorated due to your arrhythmia? | Median (Q1–Q3) | 1 (0–1) |
| | Yes, a lot | 77 (31.6) |
| | Yes, quite a lot | 117 (48) |
| | Yes, to a certain extent | 45 (18.4) |
| | No | 5 (2) |
| Q13. Do you feel worried that your symptoms will reoccur during the periods when you do not have arrhythmia? | Median (Q1–Q3) | 1 (1–2) |
| | Yes, a lot | 35 (14.3) |
| | Yes, quite a lot | 119 (48.8) |
| | Yes, to a certain extent | 55 (22.5) |
| | No | 35 (14.3) |
| ASTA III total scores, median (Q1–Q3) | | 11.5 (7–17) |

Data are presented as number (percentage) unless otherwise indicated.

**a** The key to the score calculations in the Polish version of the ASTA questionnaire is available with the authors

**TABLE 5** Data quality and item-total correlations for the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia's Symptom Scale (Part II – item 6) (n = 244)

| Item | Item statistics | | Item score distributions, n (%) | | | |
|---|---|---|---|---|---|---|
| | Item-total correlation | Mean (SD) | No | Yes, to a certain extent | Yes, quite a lot | Yes, a lot |
| Q6a. Breathlessness during activity | 0.378 | 1.19 (1.19) | 100 (41.0) | 50 (20.5) | 42 (17.2) | 52 (21.3) |
| Q6b. Breathlessness even at rest | 0.369 | 0.38 (0.68) | 175 (71.7) | 49 (20.1) | 16 (6.6) | 4 (1.6) |
| Q6c. Dizziness | 0.396 | 0.87 (1.05) | 122 (50.0) | 61 (25.0) | 32 (13.1) | 29 (11.9) |
| Q6d. Cold sweats | 0.156 | 0.45 (0.81) | 174 (71.3) | 39 (16.0) | 22 (9.0) | 9 (3.7) |
| Q6e. Weakness / fatigue | 0.506 | 0.97 (1.04) | 105 (43.0) | 72 (29.5) | 36 (14.8) | 31 (12.7) |
| Q6f. Tiredness | 0.492 | 1.00 (1.03) | 98 (40.2) | 80 (32.8) | 34 (13.9) | 32 (13.1) |
| Q6g. Chest pain | 0.361 | 0.92 (1.02) | 115 (47.1) | 55 (22.5) | 52 (21.3) | 22 (9.0) |
| Q6h. Pressure/ discomfort in the chest | 0.374 | 0.84 (0.93) | 111 (45.5) | 78 (32.0) | 38 (15.6) | 17 (7.0) |
| Q6i. Worry / anxiety | 0.492 | 1.12 (1.06) | 85 (34.8) | 83 (34.0) | 38 (15.6) | 38 (15.6) |
| Total | 0.323 | 7.74 (4.93) | | | | |

Cronbach α = 0.718

**TABLE 6** Corrected item-total correlations for the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia (ASTA) symptom scale (n = 244)

| Item | Mean if deleted | Mean (SD) if deleted | Corrected item-total correlation | Cronbach α if the item is deleted |
|---|---|---|---|---|
| ASTA II-6a | 6.55 | 4.35 | 0.378 | 0.698 |
| ASTA II-6b | 7.36 | 4.63 | 0.369 | 0.700 |
| ASTA II-6c | 6.87 | 4.41 | 0.396 | 0.692 |
| ASTA II-6d | 7.29 | 4.73 | 0.156 | 0.728 |
| ASTA II-6e | 6.77 | 4.31 | 0.506 | 0.670 |
| ASTA II-6f | 6.74 | 4.33 | 0.492 | 0.673 |
| ASTA II-6g | 6.82 | 4.46 | 0.361 | 0.699 |
| ASTA II-6h | 6.90 | 4.50 | 0.374 | 0.696 |
| ASTA II-6i | 6.62 | 4.32 | 0.492 | 0.673 |

Cronbach α = 0.718

**TABLE 7** Item-total correlations and exploratory factor analysis for the Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia health-related quality of life scale (n = 244)

| Items | Mean if deleted | Mean if deleted | Item-total correlation | Cronbach α if the item is deleted | Factor loadings (varimax raw) | |
|---|---|---|---|---|---|---|
| | | | | | Psychical subscale items, 1–5[a] | Mental subscale items, 6–13[b] |
| ASTA III-1 | 10.9 | 6.3 | 0.399 | 0.851 | 0.65 | |
| ASTA III-2 | 11.5 | 6.3 | 0.589 | 0.841 | 0.87 | |
| ASTA III-3 | 11.5 | 6.3 | 0.481 | 0.846 | 0.81 | |
| ASTA III-4 | 11.1 | 6.1 | 0.586 | 0.839 | 0.69 | |
| ASTA III-5 | 10.7 | 6.1 | 0.613 | 0.838 | 0.60 | |
| ASTA III-6 | 11.4 | 6.2 | 0.604 | 0.838 | | 0.69 |
| ASTA III-7 | 11.0 | 6.1 | 0.688 | 0.833 | | 0.70 |
| ASTA III-8 | 11.2 | 6.3 | 0.541 | 0.843 | | 0.52 |
| ASTA III-9 | 11.1 | 6.2 | 0.473 | 0.848 | | 0.50 |
| ASTA III-10 | 11.6 | 6.5 | 0.305 | 0.856 | | 0.47 |
| ASTA III-11 | 10.9 | 6.1 | 0.534 | 0.843 | | 0.80 |
| ASTA III-12 | 11.2 | 6.3 | 0.582 | 0.841 | | 0.63 |
| ASTA III-13 | 10.7 | 6.4 | 0.331 | 0.856 | | 0.61 |
| Mean (SD), 12.1 (6.7)<br>Cronbach α = 0.855<br>Standardized α = 0.857<br>Mean item-total correlation *r* = 0.323 | | | | Explained variance<br>Proportion total | 3.39<br>0.26 | 3.22<br>0.25 |
| Physical subscale items 1–5[a] | | | 0.489 | Mean (SD), 4.52 (2.71) | Cronbach α = 0.813 | |
| Mental subscale items 6–13[a] | | | 0.351 | Mean (SD), 7.54 (4.50) | Cronbach α = 0.807 | |

**a** In the original Swedish version of the ASTA, the physical subscale consists of items 1–5, 10, and 12, and the mental subscale consists of items 6–9, 11, and 13.

**TABLE 8** Goodness-of-fit indices for the 1- and 2-factor models for Arrhythmia-Specific Questionnaire in Tachycardia and Arrhythmia health--related quality of life scale (n = 244)

| Model | $\chi^2$ goodness of fit | | | RMSEA | | | CFI | TLI |
|---|---|---|---|---|---|---|---|---|
| | $\chi^2$ | df | *P* | RMSEA | 95% CI | CFit | | |
| 1-factor | 318.2 | 64 | <0.001 | 0.085 | 0.063–0.105 | 0.193 | 0.947 | 0.936 |
| 2-factor | 89.4 | 62 | 0.013 | 0.059 | 0.029–0.083 | 0.387 | 0.988 | 0.983 |

Abbreviations: CFI, comparative fit index (Q0.95); CFit, close fit using RMSEA (>0.05); RMSEA, root-mean-square error of approximation (<0.05); TLI, Tucker–Lewis index (>0.95)

life (68.4%). They also complained of limited physical activity (34%).

### Reliability of the ASTA symptom scale

The ASTA symptom scale showed a satisfactory internal consistency with a Cronbach α of 0.718 for the 9-item scale. The basic characteristics of each item are shown in TABLE 5. There was one item (ASTA Part II-Q6d, cold sweats) that, if deleted, increased the α value for the ASTA symptom scale (α = 0.728).

**Construct validity** All items showed good item--total correlations with the values ranging from 0.361 to 0.506, except item ASTA Part II-Q6d, cold sweats, which showed an item-total correlation of 0.156. The mean value for item-total correlations was 0.323. Data are shown in TABLE 5. Corrected item-total correlations ranged from 0.156 for item ASTA Part II-Q6d, cold sweats, to 0.506 for item ASTA Part II-Q6e, weakness/fatigue. Data are shown in TABLE 6.

### Reliability and validity of the ASTA Part III health-related quality of life scale

*The Polish version of the ASTA HRQoL 13-item scale showed an α of 0.855. The physical subscale had an α of 0.813, and the mental subscale, of 0.807.*

**Construct validity** *Item-total correlations ranged between 0.331 and 0.688. The average item-total correlation was 0.323 for the total scale, 0.359 for the physical subscale, and 0.385 for the mental subscale. Data are shown in* TABLE 7.

### Exploratory factor analysis

A 2-factor model was performed and for factor 1 (the physical scale with 5 items), the varimax ranged between 0.470 and 0.804, and for factor 2 (the mental scale with 8 items), the varimax ranged between 0.597 and 0.873. Factor loadings for both models are shown in TABLE 7.

### Confirmatory factor analysis

A respecified model with correlated residual variances was evaluated. The RMSEA was 0.085 for the 1-factor model and 0.059 for the 2-factor model. A comparison of the 1- and 2-factor models showed that Cfit was better for the 2-factor model (0.387 vs 0.193; P = 0.013 vs P <0.001). Initial CFA analyses showed that the 1- and 2-factor models had similar properties, with strong factor loadings and satisfactory goodness-of-fit values according to the CFI (0.947 for the 1-factor model vs 0.988 for the 2-factor model) and TLI (0.936 for the 1-factor model and 0.983 for the 2-factor model). Data are shown in TABLE 8.

## DISCUSSION

The ASTA is a new questionnaire developed by Walfridsson et al[7,10] for the assessment of arrhythmia-related symptoms and their impact on the HRQoL. So far, the questionnaire has been validated in its original Swedish version, but there will soon be data from the validation work of the Danish, Brazilian–Portuguese, and English versions.

The ASTA questionnaire was designed for patients with various arrhythmias. In a subsequent published validation work, the ASTA scales showed good psychometric properties in patients with various forms of arrhythmias, including those with known AF[7] and in the assessments of the HRQoL in patients with known AF[17] and among those being treated with radiofrequency ablation for AF.[18,19]

The validation of the translated Polish version of the original Swedish version demonstrated satisfactory psychometric properties for the scales in ASTA Part II and Part III.[7,10] The Polish translation of the ASTA was well accepted by patients due to its user-friendly format and accurate representation of the clinical symptoms these patients experience. The present psychometric evaluation confirmed the instrument's specificity in the Polish setting. Even though the Cronbach α values were slightly lower in the Polish version of the ASTA questionnaire concerning the ASTA symptom and HRQoL total scale compared with the original version, they were still within the range indicating its suitability for use in Polish patients with AF. The possible reasons for the lower Cronbach α include the fact that this was an older patient population with a high proportion of women and that all patients had AF with half of them having been diagnosed with permanent AF.

Regarding the construct validity in the ASTA symptom scale, we found sufficient results for all items except cold sweats. The Cronbach α values and item-total correlations are sample-dependent tests and are valuable when

investigators perform these tests when using the questionnaire.

All of the other items exceeded the limit for satisfactory item-total correlations in the ASTA symptom scale, indicating that the items measured the same concept.[15] The most common symptoms reported by AF patients are weakness, heart palpitations, shortness of breath, chest pain, and psychosocial distress.[19] The patients in our study also experienced breathlessness during activity, worry / anxiety, and weakness / fatigue. This is consistent with the findings presented by Walfridsson et al,[7] where the most common reported symptoms were weakness / fatigue, breathlessness during activity, and tiredness.

The patient's daily life situation can be unpredictable and insecure, especially for those with recurrent and frequent attacks, who never know when the arrhythmia will occur next.[2] Most patients in the present study had experienced arrhythmia fewer than 5 times over the preceding 3 months, and even if more than half of the patients had permanent AF, they rarely reported the episodes lasting longer than 1 hour. These findings differ from those reported by the authors of the original Swedish ASTA questionnaire, where the symptoms lasted longer.[7]

The most common descriptions of the palpitations were fast heartbeats, irregular heartbeats, and heartbeats harder than usual. The findings in the original ASTA validation study and the Polish validation are consistent with patients reporting fast, irregular, and hard heartbeats as the most common experience of AF presence.[7] The least common complaints in the Swedish and Polish validation population were breathlessness at rest, cold sweats, dizziness, and chest pain.

The 2016 European Society of Cardiology guidelines for the management of AF with regard to planning patient care state that explaining the expected benefits to each patient at the start of AF management will prevent unfounded expectations and has the potential to optimize the HRQoL.[19] Introducing the evaluation of the impact of AF symptoms into daily clinical practice can help in care planning.

The present study comprised a psychometric evaluation of ASTA Part III, focusing on HRQoL assessment in AF patients. Measures of the scale's reliability indicated good psychometric properties, similar to those reported for the original version.[10]

In terms of validity, the evaluation of construct validity expressed with item-total correlations showed satisfactory results for all items in the HRQoL scale. The ASTA HRQoL scale is divided into 2 subscales, assessing the patients' physical and mental functioning.[10] For the Polish version of the ASTA questionnaire, with the division into the 2 subscales: physical (items 1–5, 10, and 12) and mental (6–9, 11, and 13), the results of the CFA showed unsatisfactory results. The EFA was performed to examine another possible factor structure of the set of observed variables without imposing a predetermined structure. As a result, 2 factors were also distinguished, but items 10 and 12 (based on the value of own charges) were included in the physical subscale. In the Polish version of the ASTA scale, the physical subscale consists only of 5 items (1–5), and the mental scale, of 8 items (6–13). Such a construction improved the reliability indicators for both subscales. However, the psychometric properties in the Polish setting were satisfactory and similar to the original data from the Swedish validation for the physical subscale.[10] Both validation studies, that is, the original Swedish and the Polish versions, showed better properties when the ASTA HRQoL scale was divided into 2 subscales (2-factor model).

In the present study, the patients' sexual life and social functioning were the most affected by their arrhythmia. Importantly, in the validation study of Walfridsson et al,[10] patients experienced more physical than mental limitations. Patients with arrhythmias stated that the arrhythmia considerably restricted their ability to travel and concentrate, caused sleep problems, and adversely affected their sexual life. This is in line with the study by Walfridsson et al,[10] who reported that AF negatively affected the patients' sexual life, which is not commonly described in the literature. Almost all patients indicated that AF had a negative influence, and two-thirds of them reported the arrhythmia to impair their sexual life "a lot." In a study by Drory et al,[20] in patients with coronary artery disease and ventricular arrhythmia, paroxysms of the latter were present in 56% of the study group, but there was no correlation between arrhythmia exacerbation and their sexual activity.

Our study has some limitations. First, it was a single-center observational study with a moderate sample size. Second, it examined a homogeneous group of patients with AF only. In further studies, the factor structure needs to be evaluated regarding invariance across groups of different arrhythmia diagnoses. The ASTA questionnaire also needs to be further evaluated regarding known-groups validity, test-retest reliability, and responsiveness.

An additional limitation of the study is the lack of comparison of the symptom burden and HRQoL in the ASTA scales with other general and arrhythmia-specific questionnaires.

In conclusion, the psychometric properties of the Polish version of the ASTA questionnaire were found to be overall satisfactory, both for the ASTA Part II (symptom burden) and Part III (HRQoL). The ASTA questionnaire is now available in the Polish version and can be a valuable and useful tool both in clinical practice and research, facilitating patient follow-up over time.

## SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/kardiologiapolska.

## ARTICLE INFORMATION

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