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Non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation in secondary stroke and systemic embolism prevention

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Abstract

Background: *Oral anticoagulants (OAC) are recommended in all patients with atrial fibrillation (AF) after thromboembolic events without contraindications. It is hypothesized herein, that the majority of patients with AF after thromboembolic events receive OAC and the presence of specific factors, predisposes the use of non-vitamin K antagonist oral anticoagulants (NOACs).*

Methods: *This is a retrospective study, encompassing patients with AF hospitalized in a reference cardiology center over the years 2014–2017. Thromboembolic events were defined as: ischemic stroke, transient ischemic attack and systemic embolism. Inclusion criteria were the following: diagnosis of non-valvular AF at discharge from hospital, hospitalization not resulting in death.*

Results: *Among 2834 hospitalized patients with AF, a history of thromboembolic events was identified in 347 (12.2%) patients. In the group studied, of 347 patients with AF after a thromboembolic event, 322 (92.8%) received OAC, including 133 patients on vitamin K antagonist (41.3% of patients on OAC) and 189 patients on NOACs (58.7% of patients on OAC). Among patients treated with NOACs the majority were on dabigatran (116 patients, 61.4%), followed by rivaroxaban (54 patients, 28.6%), and apixaban (19 patients, 10%). Multivariate logistic regression analysis demonstrated that the presence of arterial hypertension reduced the chance for NOACs use (odds ratio [OR] 0.4, 95% confidence interval [CI] 0.2–0.9, $p = 0.04$) and left atrial size ≤ 40 mm was a factor increasing the chance for the use of NOACs (OR 2.5, 95% CI 1.1–5.8, $p = 0.03$).*

Conclusions: *Nearly all hospitalized patients with AF received OAC in the secondary prevention of thromboembolic complications. NOACs were used for secondary prevention of stroke among patients with AF in patients with fewer comorbidities.* (Cardiol J XXXX; XX, X: xx–xx)

Key words: atrial fibrillation, oral anticoagulants, secondary prevention, thromboembolic event, stroke

Introduction

Atrial fibrillation (AF) is the most common supraventricular arrhythmia. Thromboembolic events, mainly involving cerebral circulation, constitute its most serious complication [1, 2]. In developed countries nearly 85% of strokes are of ischemic origin caused by a blockage of blood flow to the brain through narrowed or closed arteries, while 15% of strokes are hemorrhagic [3]. It has been established that AF is associated with a 5-fold increase in the risk of ischemic stroke and is gen-

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erally responsible for 15–20% of all strokes [4, 5]. A history of thromboembolism in a patient with AF is the strongest risk factor for another thromboembolic event [6]. Oral anticoagulants (OAC) should be used for prevention of thromboembolism among patients with AF and the risk factors for such events [7]. Non-vitamin K antagonist oral anticoagulants (NOACs) are used increasingly more often and are characterized by at least a similar or greater effectiveness compared to that of vitamin K antagonists (VKA) [8–11].

The aim of this study was to assess the frequency of use of NOACs among hospitalized patients with AF and a history of thromboembolism, as well as to analyze factors which predispose the choice of NOACs in this group of patients.

Methods

Study group

Patients with AF hospitalized at a reference cardiology center, over the years 2014–2017, were included in this retrospective analysis. The following inclusion criteria of the study were applied: diagnosis of AF at discharge from hospital, hospitalization not resulting in death. Patients with valvular AF (mechanical valve prosthesis, severe mitral stenosis) were excluded from the study. Thromboembolic complications were defined as: ischemic stroke, transient ischemic attack (TIA), and systemic embolism. Anticoagulation treatment was evaluated at discharge from the hospital.

Statistical analysis

Arithmetic means, standard deviations, medians and quartiles were used to describe quantitative data. Distribution of qualitative data was presented as frequency and percentages. Frequencies were compared using the χ^2 test or the exact Fisher test. Normality of distribution was tested with the Shapiro-Wilk test. If the assumption of normality of distribution was fulfilled, the distributions of quantitative variables were compared using the Student t-test, while in the absence of normality of distribution, the U Mann-Whitney test was applied. Uncorrected (crude) and corrected (adjusted) odds ratios (OR) together with 95% confidence intervals (CIs) were determined using a logistic regression model. Multivariate logistic regression analysis included variables with statistically significant OR, confirmed in univariate analysis. All statistical tests conducted were two-sided and zero hypotheses were rejected when $p < 0.05$. The R software v. 3.4.3 (R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/) and STATISTICA v. 12 were used to conduct the analyses.

Table 1. Anti-stroke prophylaxis in patients with atrial fibrillation after thromboembolic complications (n = 347).

Type of prophylaxis	Number and percentage of patients
Oral anticoagulants	322 (92.8%)
Vitamin K antagonists	133 (38.3%)
Non-vitamin K oral anticoagulant:	189 (54.5%)
Apixaban	19 (5.5%)
Dabigatran	116 (33.4%)
Rivaroxaban	54 (15.6%)
Antiplatelet medicine / medicines	9 (2.6%)
Low molecular weight heparin	7 (2%)
Without prevention	9 (2.6%)

Results

In a group of 2834 consecutively hospitalized patients with AF, a history of thromboembolic complications was noted in 347 (12.2%) patients. Among the 347 patients with AF after thromboembolic events, 245 (70.6%) patients were diagnosed with stroke, 56 (16.1%) patients with TIA, 37 (10.7%) with systemic embolism, and more than one presentation of thromboembolic complication were noted in 9 (2.6%) patients.

In the group of 347 patients examined with AF after thromboembolic event, 49.6% were male and mean patient age amounted to 75.1 years. Fifty-one (14.7%) patients were under 65 years of age, 104 (30%) patients were aged 65–74, 133 (38.3%) patients were aged 75–84 years, and 59 patients were at least 85 (17%). A 128 (36.9%) patients presented with paroxysmal AF, 48 (13.8%) patients with persistent AF, and 171 (49.3%) with permanent arrhythmia. In the study group of 347 AF patients with a history of thromboembolic events, 322 (92.8%) received an OAC at the time of discharge from the hospital, including 133 on VKA (41.3% of patients treated with OAC) and 189 on NOACs (58.7% of patients with OAC). Table 1 presents pharmacological means of stroke prevention in the study group.

In a group of 189 patients treated with NOACs dabigatran was used most frequently — 116

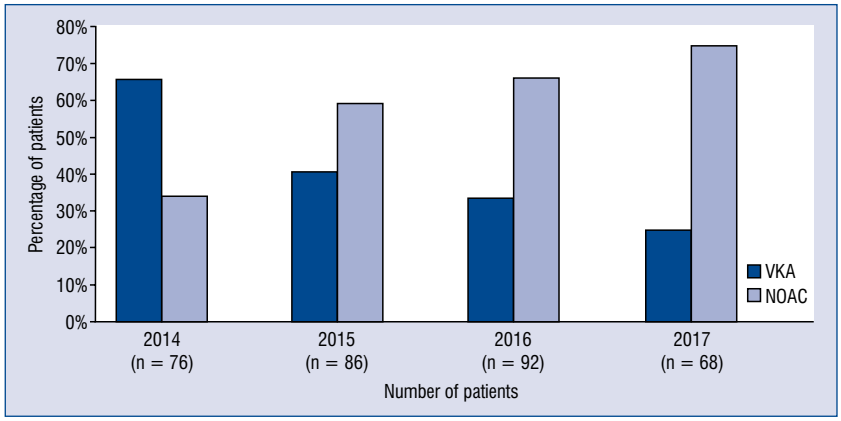

Figure 1. Percentage of patients treated with vitamin K antagonist (VKA) and non-vitamin K antagonist oral anticoagulants (NOAC) with atrial fibrillation after thromboembolic complications hospitalized between 2014 and 2017.

patients (61.4% of subjects were treated with NOACs), followed by rivaroxaban — 54 (28.6% of subjects were treated with NOACs), and apixaban — 19 patients (10% of subjects were treated with NOACs). Standard doses were administered in 76 (40.2%) patients on NOACs, while 113 (59.8%) patients received reduced doses.

The following number of patients with AF and history of thromboembolic events were hospitalized during the years 2014–2017: 76, 86, 92, and 68 patients, respectively. A significant increase in the proportion of patients on NOACs were among all OAC-treated subjects: from 34.2% in 2014 to 75% of subjects in 2017 (Fig. 1).

Patients with AF and a history of thromboembolic events treated with VKA vs. NOACs with regard to age, type of AF, and comorbidities (Table 2) were compared. Patients with AF, who were prescribed a NOACs suffered from arterial hypertension heart failure, or myocardial infarction less often than those receiving VKA. They were also characterized by lower mean $CHADS_2$ and CHA_2DS_2VASc scores as well as higher left ventricular ejection fraction and smaller left atrial dimension in echocardiographic assessment.

Univariate logistic regression analysis demonstrated that among patients after thromboembolic complications the following characteristics significantly reduced the chance of receiving a prescription for NOACs: arterial hypertension, heart failure, history of myocardial infarction, and $CHADS_2$ score ≥ 4 points. Among echocardiographic parameters ejection fraction < 50% significantly reduced chance for the use of NOACs in the group studied. However, left atrial size ≤ 40 mm was a factor significantly increasing the likelihood of being prescribed NOACs (Table 3). Multivariate logistic regression analysis showed that arterial hypertension significantly reduced the chance of NOACs use, while left atrial size ≤ 40 mm significantly increased the likelihood of NOACs administration in patients with AF and a history of thromboembolic events (Table 4).

Discussion

In the present study, encompassing almost 3000 hospitalized patients with AF, thromboembolic events were diagnosed in 12% of subjects. In the PREFER registry thromboembolic complications were noted in 8.4% of patients with AF [12]. A similar proportion of patients with a history of stroke, amounting to 10.5%, was found in the 2nd phase of the GLORIA-AF registry [13]. A higher proportion of patients after stroke/TIA than in the current study was established in the GARFIELD registry — it amounted to 15.2% in cohort I, and 21.4% in cohort II. In the Polish population of patients included in the GARFIELD registry the percentage of patients after stroke/TIA was lower and amounted to 8.3% and 7.9% in cohort I and II, respectively [14]. The population of patients in the present study was higher than in the GARFIELD registry — mean patient age was 75 years, while in the GARFIELD registry it amounted to 67 years in the Polish population; in the European population it amounted to 73 years in cohort II and 72 years in cohort I [14]. Among 2259 British patients with AF remaining under the care of general practitioners, 19% had a history of stroke. Mean age of patients in this study was similar to that in the current study — 76 years [15].

Patients with a history of thromboembolic complications have at least 2 points on the

Table 2. Clinical characteristics of patients with atrial fibrillation vitamin K antagonist (VKA) or non-vitamin K antagonist oral anticoagulant (NOAC)-treated after thromboembolic events.

Clinical feature	OAC group (n = 322)	VKA group (n = 133)	NOAC group (n = 189)	P
Age [years]				0.81
Mean ± SD	74.9 ± 9.9	74.8 ± 9.5	74.9 ± 10.9	
Median (Q1–Q3)	76 (68–83)	76 (68–83)	76 (68–83)	
Age [years]				0.61
Age < 50	3 (0.9%)	0 (0.0%)	3 (1.6%)	
Age 50–64	45 (14.0%)	18 (13.5%)	27 (14.3%)	
Age 65–74	99 (30.7%)	43 (32.3%)	56 (29.6%)	
Age > 74	175 (54.3%)	72 (54.1%)	103 (54.5%)	
Female	165 (51.2%)	71 (53.4%)	94 (49.7%)	0.52
Form of atrial fibrillation				0.59
Paroxysmal	161 (50.0%)	62 (46.6%)	99 (52.4%)	
Persistent	116 (36.0%)	51 (38.4%)	65 (34.4%)	
Permanent	45 (14.0%)	20 (15.0%)	25 (13.2%)	
Medical history				
Hypertension	258 (80.1%)	114 (85.7%)	144 (76.2%)	0.03
Heart failure	227 (70.5%)	106 (79.7%)	121 (64.0%)	0.002
Diabetes mellitus	115 (35.7%)	47 (35.3%)	68 (36.0%)	0.91
Previous stroke	234 (72.7%)	99 (74.4%)	135 (71.4%)	0.55
Previous TIA	60 (18.6%)	26 (19.5%)	34 (18.0%)	0.72
Coronary artery disease	101 (31.4%)	42 (31.6%)	59 (31.2%)	0.95
Myocardial infarction	91 (28.3%)	48 (36.1%)	43 (22.8%)	0.009
PCI	53 (16.5%)	27 (20.3%)	26 (13.8%)	0.12
CABG	31 (9.6%)	17 (12.8%)	14 (7.4%)	0.11
COPD	29 (9.0%)	13 (9.8%)	16 (8.5%)	0.69
Hyperthyroidism	21 (6.5%)	10 (7.5%)	11 (5.8%)	0.54
Hypothyroidism	31 (9.6%)	10 (7.5%)	21 (11.1%)	0.28
$CHADS_2$ [points]				
Mean ± SD	4.4 ± 1.0	4.5 ± 0.9	4.3 ± 1.0	0.04
Median (Q1–Q3)	4 (4–5)	5 (4–5)	4 (4–5)	
$CHADS_2$ 2–3	58 (18%)	15 (11.3%)	43 (22.8%)	0.008
CHADS2 > 3	264 (82%)	118 (88.7%)	146 (77.2%)	0.008
CHA_2DS_2VASc [points]				
Mean ± SD	6.5 ± 1.4	6.7 ± 1.3	6.4 ± 1.5	0.0 8
Median (Q1–Q3)	7 (6–7)	7 (6–8)	6 (5–7)	
CHA_2DS_2VASc 2–3	9 (2.8%)	1 (0.8%)	8 (4.2%)	0.09
CHA_2DS_2VASc > 3	313 (97.2%)	132 (99.2%)	181 (95.8%)	0.09
HAS-BLED				
Mean ± SD	2.6 ± 0.8	2.7 ± 0.7	2.6 ± 0.8	
Median (Q1–Q3)	3 (2–3)	3 (2–3)	3 (2–3)	
ECHOCARDIOGRAPHY				
EF [%]	[n = 250]	[n = 106]	[n = 144]	0.04
Mean ± SD	46.9 ± 12.9	44.9 ± 13.7	48.4 ± 12.2	
Median (Q1–Q3)	50 (40–55)	49,5 (38–55)	50 (43–55)	
EF > 50%	101 (40.4%)	34 (32.1%)	56 (38.9%)	
EF 50–30%	115 (46.0%)	54 (50.9%)	61 (42.4%)	
EF < 30%	101 (13.6%)	34 (32.1%)	56 (38.9%)	

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Table 2 (cont.). Clinical characteristics of patients with atrial fibrillation vitamin K antagonist (VKA) or non-vitamin K antagonist oral anticoagulant (NOAC)-treated after thromboembolic events.

Clinical feature	OAC group (n = 322)	VKA group (n = 133)	NOAC group (n = 189)	P
LA [mm]	[n = 248]	[n = 106]	[n = 142]	< 0.0001
Mean ± SD	47.3 ± 8.2	49.6 ± 8.9	45.7 ± 7.3	
Median (Q1–Q3)	46 (42.5–52)	48.5 (45–54)	45 (41–50.7)	
LA > 40 mm	[n = 246] 205 (83.3%)	[n = 106] 97 (91.5%)	[n = 142] 108 (76.1%)	0.002
LABORATORY TESTS				
Hemoglobin [g/dL]	[n = 321]	[n = 132]	[n = 189]	0.38
Mean ± SD	13.2 ± 1.7	13.1 ± 1.7	13.2 ± 1.6	
Median (Q1–Q3)	1.2 (12.1–14.3)	13.2 (12.1–14.2)	13.2 (12.1–14.5)	
GFR [mL/min]				0.16
Mean ± SD	55.8 ± 18.6	53.7 ± 17.3	57.3 ± 19.4	
Median (Q1–Q3)	54.9 (43.8–66.3)	53.7 (42.6–65.6)	56.0 (44.3–67.4)	
GFR > 60	114 (35.4%)	43 (32.3%)	118 (37.6%)	0.43
GFR 60–46	111 (34,5%)	48 (36.1%)	63 (33.3%)	
GFR 45–30	63 (19.6%)	25 (18.8%)	38 (20.1%)	
GFR 29–15	23 (71%)	12 (9.0%)	11 (5.8%)	
GFR < 15	1 (0.3%)	0 (0.0%)	1 (0.5%)	

CABG — coronary artery bypass grafting; COPD — chronic obstructive pulmonary disease EF — ejection fraction; GFR — glomerular filtration rate; LA — left atrial; PCI — percutaneous coronary intervention; TIA — transient ischemic attack

Table 3. Factors increasing the chances of using non-vitamin K antagonist oral anticoagulant (NOAC) in patients with atrial fibrillation after thromboembolic complications — univariate logistic regression analysis.

Factors	VKA group (n = 133)	NOAC group (n = 322)	Crude OR	95% CI	P
Sex					
Female	71 (53.4%)	94 (49.7%)	Ref. level		
Male	62 (46.6%)	95 (50.3%)	1.2	0.7–1.8	0.52
Age [years]	74.8 ± 9.5	74.9 ± 10.3	1.0	0.98–1.02	0.96
< 65	18 (13.5%)	30 (15.9%)	Ref. level		
65–74	43 (32.3%)	56 (29.6%)	0.8	0.4–1.6	0.49
> 74	72 (54.1%)	103 (54.5%)	0.9	0.4–1.7	0.65
Form of AF					
Paroxysmal	51 (38.3%)	65 (34.4%)	Ref. level		
Persistent	20 (15.0%)	25 (13.2%)	1.0	0.5–2.0	0.96
Permanent	62 (46.6%)	99 (52.4%)	1.3	0.8–2.0	0.36
Form of AF					
Permanent	62 (46.6%)	99 (52.4%)	Ref. level		
Persistent	51 (38.3%)	65 (34.4%)	0.8	0.5–1.3	0.36
Paroxysmal	20 (15.0%)	25 (13.2%)	0.8	0.4–1.5	0.47
Hypertension					
No	19 (14.3%)	45 (23.8%)	Ref. level		
Yes	114 (85.7%)	144 (76.2%)	0.5	0.30–0.96	0.04
Heart failure					
No	27 (20.3%)	68 (36.0%)	Ref. level	0.3–0.8	0.003
Yes	106 (79.7%)	121 (64.0%)	0.5		

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Table 3 (cont.). Factors increasing the chances of using non-vitamin K antagonist oral anticoagulant (NOAC) in patients with atrial fibrillation after thromboembolic complications - univariate logistic regression analysis.

Factors	VKA group (n = 133)	NOAC group (n = 322)	Crude OR	95% CI	p
Diabetes mellitus					
No	86 (64.7%)	121 (64.0%)	Ref. level		
Yes	47 (35.3%)	68 (36.0%)	1.0	0.6–1.6	0.91
Previous stroke					
No	34 (25.6%)	54 (28.6%)	Ref. level		
Yes	99 (74.4%)	135 (71.4%)	0.9	0.5–1.4	0.55
Previous transient ischaemic attack					
No	107 (80.5%)	155 (82.0%)	Ref. level		
Yes	26 (19.5%)	34 (18.0%)	0.9	0.5–1.6	0.72
Coronary artery disease					
No	91 (68.4%)	130 (68.8%)	Ref. level		
Yes	42 (31.6%)	59 (31.2%)	1.0	0.6–1.6	0.95
Myocardial infarction					
No	85 (63.9%)	146 (77.2%)	Ref. level		
Yes	48 (36.1%)	43 (22.8%)	0.5	0.3–0.9	0.009
Percutaneous coronary intervention					
No	106 (79.7%)	163 (86.2%)	Ref. level		
Yes	27 (20.3%)	26 (13.8%)	0.6	0.3–1.1	0.12
Coronary artery bypass graft					
No	116 (87.2%)	175 (92.6%)	Ref. level		
Yes	17 (12.8%)	14 (7.4%)	0.5	0.3–1.2	0.11
Chronic obstructive pulmonary disease					
No	120 (90.2%)	173 (91.5%)	Ref. level		
Yes	13 (9.8%)	16 (8.5%)	0.9	0.4–1.8	0.69
$CHADS_2$ score	4.5 ± 0.9	4.3 ± 1.0	0.8	0.6–0.97	0.029
2–3	15 (11.3%)	43 (22.8%)	Ref. level		
> 3	118 (88.7%)	146 (77.2%)	0.4	0.2–0.8	0.001
CHA_2DS_2VASC score	6.7 ± 1.3	6.4 ± 1.5	0.9	0.7–1.01	0.06
2–3	1 (0.8%)	8 (4.2%)	Ref. level		
> 3	132 (99.2%)	181 (95.8%)	0.2	0.02–1.4	0.10
HASBLED score	2.7 ± 0.8	2.6 ± 0.8	0.9	0.7–1.2	0.56
Ejection fraction [%]	44.9 ± 13.7	48.4 ± 12.2	1.02	1.001–1.04	0.037
Missing value	27 (20.3%)	45 (23.8%)	–		
> 50	34 (25.6%)	67 (35.4%)	Ref. level		
30–50%	54 (40.6%)	61 (32.3%)	0.6	0.3–0.995	0.048
< 30%	18 (13.5%)	16 (8.5%)	0.5	0.2–0.994	0.048
Left atrial group [mm]	49.6 ± 8.9	45.7 ± 7.3	0.94	0.91–0.97	0.0004
Missing value	27 (20.3%)	47 (24.9%)	–		
> 40 mm	97 (72.9%)	108 (57.1%)	Ref. level		
≤ 40 mm	9 (6.8%)	34 (18.0%)	3.4	1.5–7.4	0.002
Hemoglobin [g/dL]	13.1 ± 1.7	13.2 ± 1.6	1.1	0.9–1.2	0.38
< 12 g/dL	31 (23.3%)	38 (20.1%)	Ref. level		
≥ 12 g/dL	101 (75.9%)	151 (79.9%)	1.2	0.7–2.1	0.47
GFR [mL/min]	53.7 ± 17.3	57.3 ± 19.4	1.01	0.998–1.023	0.09
> 60 mL/min	43 (32.3%)	71 (37.6%)	Ref. level		
60–46 mL/min	50 (37.6%)	66 (34.9%)	0.8	0.5–1.4	0.41
45–30 mL/min	26 (19.5%)	40 (21.2%)	0.9	0.5–1.7	0.82
< 30 mL/min	14 (10.5%)	12 (6.3%)	0.5	0.2–1.2	0.13

Data are shown as number (percentage) or mean ± standard deviation. CI — confidence interval; GFR — glomerular filtration rate; OR — odds ratio; VKA — vitamin K antagonist

Table 4. Factors increasing the chances of using non-vitamin K antagonist oral anticoagulant in patients with atrial fibrillation after thromboembolic complications — multivariate logistic regression analysis.

Factors	Adjusted OR	95% CI	P
Hypertension			
No	Ref. level		
Yes	0.4	0.2–0.9	0.04
Heart failure			
No	Ref. level		
Yes	0.6	0.3–1.2	0.14
Myocardial infarction			
No	Ref. level		
Yes	0.6	0.3–1.1	0.13
$CHADS_2$ score			
2–3 points	Ref. level		
> 3 points	1.0	0.4–2.7	0.97
Ejection fraction			
> 50%	Ref. level		
50–30%	0.8	0.4–1.4	0.39
< 30%	0.8	0.3–1.8	0.53
Left atrial			
> 40 mm	Ref. level		
≤ 40 mm	2.5	1.1–5.8	0.03

CI — confidence interval; OR — odds ratio

CHA_2DS_2VASc scale, although usually the score is higher due to age and comorbidities. In the present study the majority of patients were over 75 years and mean CHA_2DS_2VASc of patients treated with OAC amounted to 6.5 points, thus this study group was at the highest risk of thromboembolic events.

Lopatowska et al. [16] analyzed antithrombotic management in AF implemented into practice in a group of 1556 patients. The study showed that the use of OAC increased with increasing CHA_2DS_2VASc score but was less frequent in score ≥ 4 irrespectively of whether it was primary or secondary prevention.

According to the current guidelines of the European Society of Cardiology (ESC) on the treatment of patients with AF, anticoagulation is indicated in men with at least 2 points and women with at least 3 points on the CHA_2DS_2VASc scale. Therefore, each patient who had suffered a thromboembolic complication of AF should receive an OAC [17]. Data from registries demonstrate that clinical practice differs significantly from the guidelines. It is estimated that half of patients with AF and no risk factors for thromboembolic complications receive an OAC and 1/3 of patients at high risk of thromboembolic events remain without prophylactic anticoagulation [18]. However, only about 10% with AF have absolute contraindications to anticoagulant treatment. Mazurek et al. [19] showed that in a group of 2250 patients with AF contraindications to OAC were present in only 8.3% of subjects. In the same study it was shown that among patients with AF at high risk of thromboembolic events both overtreatment, as well as undertreatment, were associated with significant increases in the risk of stroke, while undertreatment was also associated with increased total mortality [19]. In the present study OAC was administered in 93% of patients, which is in agreement with the reports of other authors, who confirmed that contraindications to OAC are present in approximately one in ten patients with AF. In Darlington Atrial Fibrillation Registry on 2259 patients with AF, a history of stroke was identified in 18.9% of subjects [20]. In this group of patients OAC in monotherapy or combined with an antiplatelet drug was applied in 61.7% of subjects, 1/3 of patients received only an antiplatelet drug, while 6.5% of subjects with AF and history of stroke had no anticoagulation therapy [20]. In the current study OAC was administered in 92.8% of patients with AF and history of stroke, an antiplatelet drug/drugs in 2.6% of subjects, low molecular weight heparin in 2%, and 2.6% of patients were left without prophylactic anticoagulation. In the present study the mean age of patients with AF after a thromboembolic event amounted to 75 years, while in a British study of patients after stroke it was 79.6%. Also, patients in the study herein were characterized by a higher mean CHA_2DS_2VASc score compared to that of the British authors. Significant differences regarding treatment of patients after thromboembolic complications in studies under comparison probably ensue from the fact that in the present study, prophylactic anticoagulation was implemented by a reference cardiac center, while in the British study, by general practitioners.

In the current study the majority of patients on OAC were treated with NOACs. Reduced NOACs doses were used in 60% of patients and dabigatran was the most frequent therapeutic choice. In the SAMURAI-NVAF Study encompassing 1116 patients after stroke/TIA discharged from neurology centers, the majority of patients received VKA compared to NOAC (58.2 vs. 41.8%) [21]. Rivaroxaban, usually a full dose, was the most frequently chosen NOAC in the SAMURAI-NVAF

Study, followed by dabigatran and apixaban, which were most often used in reduced doses [21]. In the Novel Oral Anticoagulants in Stroke Patients (NOACISP)-LONGTERM registry that included 251 patients after stroke, who were treated with an OAC, NOAC was administered in 78% of patients [22]. Over a 1-year observation period full adherence was noted in 77.1% of patients treated with NOAC and 83.3% of patients receiving VKA [23].

The data on anticoagulant therapy in the group of women and men after thromboembolic complications is not consistent. In the present study, no significant differences were noted between the sexes preferring NOACs treatment. However, in the SAMURAI-NVAF study, the group of men after thromboembolism events were treated with NOACs more often than with VKA [21].

In the current study NOACs was prescribed more frequently than VKA in patients with lower thromboembolic risk according to the CHA_2DS_2-VASc and $CHADS_2$ scales, as well as with non-dilated left atrium, while VKA was used more often than NOACs among patients with arterial hypertension, heart failure, history of myocardial infarction and reduced left ventricular ejection fraction. Multivariate logistic regression analysis demonstrated that diagnosis of arterial hypertension significantly reduced the chance for NOACs administration for secondary prevention of stroke among patients with AF. It may be inferred that NOACs are more likely to be selected in lower-risk patients with fewer comorbidities. In a study that included patients hospitalized over the years 2004–2012 at the documented center, among patients at high risk of thromboembolic complications, the proportion of subjects with a history of thromboembolic events was higher in the group treated with OAC compared to those not treated with OAC [24]. In a Danish study conducted between 2011 and 2013, history of stroke was a factor predisposing the use of NOACs over VKA [25]. In the 2016 ESC guidelines experts recommend a preference of NOAC to VKA or acetylscalicylic acid among patients after stroke [17]. In the present study significant increase was demonstrated in the use of NOACs in patients after thromboembolic events — in 2017, ¾ of patients treated with oral anticoagulation received a NOACs.

Limitations of the study

There are several limitations of the present study. As is the case for all retrospective studies, there exist potential unidentified confounders. Data sources could not ascertain symptom severity of AF and the date of thromboembolic complication. There was no adjustment for levels of socioeconomic status or education levels of patients in the study group.

Conclusions

Oral anticoagulants were administered for secondary prevention of thromboembolic events in nearly all hospitalized patients with AF. NOACs were used in the majority of patients treated with oral anticoagulation and they were more often used in reduced than standard doses. NOACs were more frequently used for secondary prevention of stroke in AF patients with fewer comorbidities.

Conflict of interest: Iwona Gorczyca — paid lecture for Bayer, Boehringer Ingelheim; Beata Wożakowska-Kapłon — paid lecture for Bayer, Boehringer Ingelheim, Pfizer.

References

1. January C, Wann L, Alpert J, et al. 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation. Circulation. 2014; 130(23), doi: 10.1161/cir.0000000000000041.
2. Cheng TO. Reduced risk for thromboembolism in atrial fibrillation and mitral regurgitation. Am Heart J. 1999; 138(5 Pt 1): 998–999, doi: 10.1016/s0002-8703(99)70045-1, indexed in Pubmed: 10539836.
3. Wendelboe AM, Raskob GE. Global burden of thrombosis: epidemiologic aspects. Circ Res. 2016; 118(9): 1340–1347, doi: 10.1161/CIRCRESAHA.115.306841, indexed in Pubmed: 27126645.
4. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation: a major contributor to stroke in the elderly. The Framingham Study. Arch Intern Med. 1987; 147(9): 1561–1564, indexed in Pubmed: 3632164.
5. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: the Framingham Study. Stroke. 1991; 22(8): 983–988, indexed in Pubmed: 1866765.
6. Hijazi Z, Lindbäck J, Alexander JH, et al. ARISTOTLE and STABILITY Investigators. The ABC (age, biomarkers, clinical history) stroke risk score: a biomarker-based risk score for predicting stroke in atrial fibrillation. Eur Heart J. 2016; 37(20): 1582–1590, doi: 10.1093/eurheartj/ehw054, indexed in Pubmed: 26920728.
7. Kailas SD, Thambuluru SR. Efficacy and safety of direct oral anticoagulants compared to warfarin in prevention of thromboembolic events among elderly patients with atrial fibrillation. Cureus. 2016; 8(10): e836, doi: 10.7759/cureus.836, indexed in Pubmed: 27900231.
8. Connolly S, Ezekowitz M, Yusuf S, et al. Dabigatran versus Warfarin in Patients with Atrial Fibrillation. N Engl J Med. 2009; 361(12): 1139–1151, doi: 10.1056/nejmoa0905561.
9. Patel M, Mahaffey K, Garg J, et al. Rivaroxaban versus Warfarin in Nonvalvular Atrial Fibrillation. N Engl J Med. 2011; 365(10): 883–891, doi: 10.1056/nejmoa1009638.
10. Granger C, Alexander J, McMurray J, et al. Apixaban versus Warfarin in Patients with Atrial Fibrillation. N Engl J Med. 2011; 365(11): 981–992, doi: 10.1056/nejmoa1107039.

11. Giugliano R, Ruff C, Braunwald E, et al. Edoxaban versus Warfarin in Patients with Atrial Fibrillation. N Engl J Med. 2013; 369(22): 2093–2104, doi: 10.1056/nejmoa1310907.
12. Kirchhof P, Ammentorp B, Darius H, et al. Management of atrial fibrillation in seven European countries after the publication of the 2010 ESC Guidelines on atrial fibrillation: primary results of the PREvention oF thromboemolic events--European Registry in Atrial Fibrillation (PREFER in AF). Europace. 2014; 16(1): 6–14, doi: 10.1093/europace/eut263, indexed in Pubmed: 24084680.
13. Huisman MV, Rothman KJ, Paquette M, et al. The Changing Landscape for Stroke Prevention in AF: Findings From the GLORIA-AF Registry Phase 2. J Am Coll Cardiol. 2017; 69(7): 777–785, doi: 10.1016/j.jacc.2016.11.061, indexed in Pubmed: 28209218.
14. Stępińska J, Kremis E, Konopka A, et al. Stroke prevention in atrial fibrillation patients in Poland and other European countries: insights from the GARFIELD-AF registry. Kardiol Pol. 2016; 74(4): 362–371, doi: 10.5603/KP.a2015.0173, indexed in Pubmed: 26365937.
15. Shantsila E, Wolff A, Lip GYH, et al. Optimising stroke prevention in patients with atrial fibrillation: application of the GRASP-AF audit tool in a UK general practice cohort. Br J Gen Pract. 2015; 65(630): e16–e23, doi: 10.3399/bjgp15X683113, indexed in Pubmed: 25548312.
16. Lopatowska P, Tomaszuk-Kazberuk A, Mlodawska E, et al. Do CHA2 DS2 VASc and HAS-BLED scores influence 'real-world' anticoagulation management in atrial fibrillation? 1556 patient registry from the reference cardiology centre. Pharmacoepidemiol Drug Saf. 2015; 24(12): 1297–1303, doi: 10.1002/pds.3878, indexed in Pubmed: 26419506.
17. Kirchhof P, Benussi S, Kotecha D, et al. ESC Scientific Document Group. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur Heart J. 2016; 37(38): 2893–2962, doi: 10.1093/eurheartj/ehw210, indexed in Pubmed: 27567408.
18. Mazurek M, Huisman MV, Lip GYH. Registries in atrial fibrillation: from trials to real-life clinical practice. Am J Med. 2017; 130(2): 135–145, doi: 10.1016/j.amjmed.2016.09.012, indexed in Pubmed: 27746290.
19. Mazurek M, Shantsila E, Lane DA, et al. Guideline-Adherent antithrombotic treatment improves outcomes in patients with atrial fibrillation: insights from the community-based darlington atrial fibrillation registry. Mayo Clin Proc. 2017; 92(8): 1203–1213, doi: 10.1016/j.mayocp.2017.05.023, indexed in Pubmed: 28778255.
20. Mazurek M, Shantsila E, Lane DA, et al. Secondary versus primary stroke prevention in atrial fibrillation: insights from the darlington atrial fibrillation registry. Stroke. 2017; 48(8): 2198–2205, doi: 10.1161/STROKEAHA.116.016146, indexed in Pubmed: 28679859.
21. Yoshimura S, Koga M, Sato S, et al. Two-Year Outcomes of Anticoagulation for Acute Ischemic Stroke With Nonvalvular Atrial Fibrillation - SAMURAI-NVAF Study. Circ J. 2018; 82(7): 1935–1942, doi: 10.1253/circj.CJ-18-0067, indexed in Pubmed: 29863095.
22. Seiffge DJ, Traenka C, Polymeris A, et al. Early start of DOAC after ischemic stroke: Risk of intracranial hemorrhage and recurrent events. Neurology. 2016; 87(18): 1856–1862, doi: 10.1212/WNL.0000000000003283, indexed in Pubmed: 27694266.
23. Polymeris AA, Traenka C, Hert L, et al. Frequency and Determinants of Adherence to Oral Anticoagulants in Stroke Patients with Atrial Fibrillation in Clinical Practice. Eur Neurol. 2016; 76(3-4): 187–193, doi: 10.1159/000450750, indexed in Pubmed: 27705975.
24. Gorczyca I, Wożakowska-Kapłon B, Starzyk K, et al. Evaluation of the recommended prevention of thrombosis in hospitalised patients with atrial fibrillation and high thromboembolism risk. Kardiol Pol. 2018; 76(3): 625–632, doi: 10.5603/KP.a2017.0241, indexed in Pubmed: 29297187.
25. Olesen JB, Sørensen R, Hansen ML, et al. Non-vitamin K antagonist oral anticoagulation agents in anticoagulant naïve atrial fibrillation patients: Danish nationwide descriptive data 2011-2013. Europace. 2015; 17(2): 187–193, doi: 10.1093/europace/euu225, indexed in Pubmed: 25236181.