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Two different approaches to assess adherence to medication in Polish cohort of the EUROASPIRE V registry

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Medical Research Journal 2022; Volume 7, Number 2, 108–113
10.5603/MRJ.a2022.0015
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ISSN 2451-2591
e-ISSN 2451-4101

ABSTRACT

Introduction: The implementation of guidelines on cardiovascular disease (CVD) prevention in patients at high risk of developing CVD was assessed in the EUROASPIRE V registry.

Aim of the study: This study was designed to compare a simple self-reported quantitative assessment of adherence to medication using the Medication Adherence Questionnaire (MAQ) with a qualitative evaluation based on the Adherence in Chronic Disease Scale (ACDS) in the Polish cohort of the EUROASPIRE V registry.

Material and methods: The study was performed in 200 patients (133 women and 67 men) with an average age of 51.49 (13.63) years and a history of hypertension, hypercholesterolemia or diabetes, but without prior cardiovascular events. Pharmacological treatment was applied in 127 patients (63.5%) with hypertension, 90 (45%) with hypercholesterolemia, and 31 (15.5%) with diabetes.

Results: According to the MAQ, high adherence to medication (100% or 90%) was declared by 67.7% of patients, while medium (75% or 50%) and low adherence (< 50% or 0%) by 9.7% and 22.6%, respectively. The adherence assessed with the ACDS, was high in 38.7%, medium in 44.8%, and low in 16.5% of patients. A remarkable inconsistency between ACDS and MAQ responses was found. The MAQ and the ACDS rendered consistent results in 44.8% of patients (111 out of 148), while in the remaining 55.2% (137 out of 248) of patients the results were discordant.

Conclusions: The assessment of medication adherence based on patient declarations used in the EUROASPIRE V registry is likely to overestimate the frequency of high adherence.

Key words: Adherence to medication, hypertension, diabetes, hypercholesterolemia

Med Res J 2022; 7 (2): 108–113

Introduction

The EUROASPIRE (European Action on Secondary and Primary Prevention by Intervention to Reduce Events) registry was established to identify risk factors in coronary patients with and without diabetes, describe their management through lifestyle modifications and use of drug therapies in order to provide an objective assessment of the implementation of current evi-

dence-based cardiovascular disease prevention [1]. Adherence to medication in this registry was obligatorily assessed with the Medication Adherence Questionnaire (MAQ) for simple quantitative evaluation. Self-reported drug intake is the easiest and most frequently used method of assessment of patient adherence to medication. This approach, however, can be misleading [2–5], therefore, in order to enrich the assessment with a qualitative aspect, we also applied the Adherence in

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Chronic Disease Scale (ACDS) [6–10]. To the best of our knowledge, no studies comparing these two scales (MAQ and ACSD) have been published so far.

In this paper, we present a comparative analysis of MAQ and ACDS-derived adherence assessment in the Polish cohort of the EUROASPIRE V registry.

Material and methods

Two hundred patients (133 women and 67 men) with average age of 51.49 ± 13.63 years, without prior cardiovascular events, with a history of hypertension, hypercholesterolemia or diabetes were included in the EUROASPIRE V registry in Poland. The characteristics of the studied population are shown in Table 1.

For the assessment of patient self-reported medication adherence, the MAQ was applied. The questionnaire was limited to one question: “How often do you take your medications as prescribed by the doctor?” with 6 possible answers: (5) *all the time — 100%*; (4) *almost all the time — 90%*; (3) *most of the time — 75%*; (2) *about half of the time*; (1) *less than half of the time*; (0) *I do not take the prescribed medications*. The same question was asked separately for each of the three-drug groups: antihypertensive, lipid-lowering, and antidiabetic. The MAQ results were then referred to answers to all ACDS questions.

The ACDS was developed for the assessment of the level of adherence to pharmacotherapy in patients with chronic diseases. This 7-item questionnaire includes five questions pertaining to behaviors directly determining adherence, and two questions related to situations and views influencing it indirectly.

The ACDS is available on the following website: <https://www.wnoz.cm.umk.pl/panel/wp-content/uploads/ACDS-English-version.pdf>.

The study was approved by the Bioethics Committee of Collegium Medicum, Nicolaus Copernicus University (reference number KB 587/2017).

Both MAQ and ACDS, as well as blood samples and arterial pressure measurements, were performed during the only study visit. Questionnaires were conducted by study staff asking questions to patients in direct personal contact. Completed questionnaires allowed for the identification of the respondents by the patient number to enable the correlation of the obtained results.

Statistical methods

The statistical analysis was carried out using the Statistica 13.0 package (TIBCO Software Inc, California, USA). Data were expressed as the number and the percentage. The χ^2 test was used for comparisons. Results were considered significant at $p < 0.05$.

Results

The median blood pressure for the entire population during the study visit was 125.0 (IQR 118.0–135.0) and 77.5 (IQR 70.0–82.0) for systolic and diastolic blood pressure, respectively. Abnormal blood pressure values during the study visit were found in 45 (22.5%) patients. The median value of low-density lipoprotein — cholesterol (LDL-C) plasma concentration was 3.29 (IQR 2.68–4.0). Elevated values of the LDL-C fraction (> 2.6 mmol/L) were found in 154 (77%) of the studied patients. The median glucose concentration in venous blood was 97.6 mg/dL (IQR 90.75–106.35). Elevated blood glucose levels (≥ 100 mg/dL) were found in 83 (41.5%) of study participants.

Pharmacological treatment for hypertension, hypercholesterolemia, and diabetes according to medical charts was applied in 127 (63.5%), 90 (45%), and 31 (15.5%) patients respectively (Tab. 2).

Table 1. Patients' characteristics

		N	%
Age	< 60	144	72.0
	≥ 60	56	28.0
Sex	Female	133	66.50
	Male	67	33.50
Number of pharmacologically treated diseases	1	141	70.50
	2	43	21.50
	3	7	3.50
Number of medications taken continuously	1	115	57.50
	2	52	26.00
	≥ 3	24	12.00

Table 2. Medical treatment of hypertension, hypercholesterolemia, and diabetes according to medical charts

Medical treatment	N	%
Antihypertensive medications	127	63.5
• ACEI	91	45.5
• B-blocker	40	20
• ARB	14	7
• Ca-blocker	14	7
• Diuretic	9	4.5
Lipid-lowering medications	90	45
• Statin	90	45
• Fibrat	2	1
Antidiabetic medications	31	15.5
• Metformin	26	13
• Gliclazide	4	2
• Glitazone	2	1
• Insulin	7	3.5

ACEI — Angiotensin-converting enzyme inhibitor; ARB — angiotensin receptor blocker; B-blocker — Beta-blocker

The vast majority of patients were medically treated for one disease (n = 141; 74%), while for two or three diseases, 43 (23%) and 7 (4%) patients were treated, respectively. The incidence of high ACDS and MAQ scores increases with the number of diseases treated in this relatively healthy population, however, the difference was significant only for ACDS (Tab. 3 and 4). A similar trend was observed in the number of long-term medications (Tab. 5 and 6).

According to the MAQ, 67.7% of patients with hypertension, diabetes mellitus or hypercholesterolemia declared high level of adherence (100% or 90%) to prescribed medication. Medium adherence (75% or 50%) was reported by 9.7% of patients, while low adherence (< 50% or 0%) was declared by 22.6% of

patients enrolled in the EUROASPIRE V registry. When assessed with the ACDS, high, medium, and low adherence was reported in 38.7%, 44.8%, and 16.5% of patients, respectively. The analysis of patient responses to subsequent ACDS questions in relation to the MAQ results revealed remarkable inconsistency between the two questionnaires.

MAQ and ACDS-based results of adherence assessment for the treatment of hypertension, diabetes or hypercholesterolemia are presented in Figure 1. As indicated by the MAQ, high adherence was 7-fold more frequent than the medium one and 3-fold more common than the low one. The distribution of adherence levels according to ACDS was more balanced, compared to the MAQ. The reproducibility rate of MAQ results in the

Table 3. The results of ACDS according to the number of medically treated diseases

Number of diseases	ACDS			P-value
	Low n (%)	Medium n (%)	High n (%)	
1	24 (17.02%)	65 (46.10%)	52 (36.88%)	0.0440
2	6 (13.95%)	21 (48.84%)	16 (37.21%)	
3	1 (14.29%)	0 (0%)	6 (85.71%)	

Table 4. The results of MAQ according to the number of medically treated diseases

Number of diseases	MAQ			P-value
	Low n (%)	Medium n (%)	High n (%)	
1	31 (21.99%)	18 (12.77%)	92 (65.25%)	0.1378
2	21 (24.42%)	6 (6.98%)	59 (68.60%)	
3	4 (19.05%)	0 (0%)	17 (80.95%)	

Table 5. The results of ACDS according to the number of long-term medications

Number of medications	MAQ			P-value
	Low n (%)	Medium n (%)	High n (%)	
1	22 (19.13%)	49 (42.61%)	44 (38.26%)	0.2771
2	7 (13.46%)	28 (53.85%)	17 (32.69%)	
≥ 3	2 (8.33%)	9 (37.50%)	13 (54.17%)	

Table 6. The results of MAQ according to the number of long-term medications

Number of medications	MAQ			P-value
	Low n (%)	Medium n (%)	High n (%)	
1	23 (20.00%)	17 (14.78%)	75 (65.22%)	0.0504
2	21 (26.25%)	6 (7.50%)	53 (66.25%)	
≥ 3	12 (22.64%)	1 (1.89%)	40 (75.47%)	

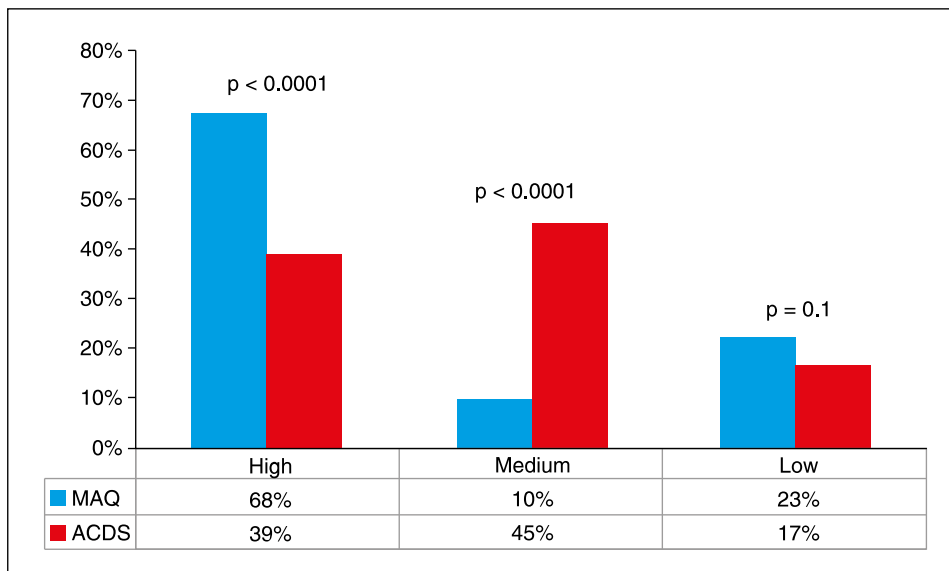


Figure 1. The results of MAQ and ACDS-based adherence assessment. ACDS — Adherence in Chronic Disease Scale; MAQ — Medication Adherence Questionnaire

ACDS was 44.8% (111 out of 148 patients), while in the remaining 55.2% (137 out of 248) of patients the results were discordant.

In order to identify the sources of these inconsistencies, the responses to ACDS questions were referred to MAQ results (Tab. 1), delivering some surprising findings. Only 77% of patients declaring high adherence and as many as 57% declaring low adherence confirmed precise intake of all medications according to healthcare provider instructions (ACDS question 1). Moreover, in the MAQ-derived high adherence cohort, 22% of patients reported arbitrary change of medication dosing without medical consultation, 20% wilful dose adjustment according to their general condition, and 25% dosing modification according to medication-related side effects (ACDS questions 2, 3 and 4). Unexpectedly, as many as 59% of MAQ responders declaring low adherence found all their medications necessary for improvement or conservation of their health (ACDS question 5). Of note, only 52%, 25%, and 30% of study participants with respectively high, medium, and low MAQ-assessed adherence reported regular interrogation by their doctor regarding possible medication-related complications (ACDS question 6). Finally, a substantial proportion (13%, 42% and 25% respectively) of patients confessed to conceal medication-related problems in medical interview (ACDS question 7).

Discussion

The primary care arm of the EUROASPIRE V registry was carried out in 78 primary care centers in 16 coun-

tries (Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Egypt, Greece, Kazakhstan, Kyrgyzstan, Lithuania, Poland, Portugal, Romania, Russia, Sweden, Ukraine and the United Kingdom) during 2017–2018 [11]. Data collection was conducted by trained research staff, who reviewed patient medical records, interviewed and examined the patients using standardized methods in all centers [12, 13]. Self-reported information on adherence to medication was obtained with the MAQ. Taking into account previous observations showing a huge discrepancy between self-reported patient adherence to treatment and one assessed by drug availability, we applied the ACDS as a second measure of adherence in the Polish cohort of the EUROASPIRE V registry [3, 10]. In this study, self-reported drug intake was 94.5%, while according to drug availability it was only 54.3%, $p < 0.0001$ [3]. Thus, we assumed that using the MAQ alone is far from sufficient to obtain a reliable assessment of adherence to medication. As expected, the proportion of patients with high self-reported adherence to medication (MAQ) in the Polish cohort of EUROASPIRE V was much higher in comparison with the ACDS (67.7% vs. 38.7%). Inaccurate estimation of adherence may result in misleading interpretations of treatment failure, posing potentially costly and dangerous effects [8, 14]. Self-reported adherence is a commonly utilized method of adherence evaluation due to its simplicity, real-time feedback, and low cost, however, patients tend to underreport non-adherence to avoid disapproval from their healthcare providers [15–17]. To overcome this drawback, a number of valid and reliable scales assessing patient adherence to medication have been developed [8, 18]. Scale validity refers to the degree of confidence we can have

Table 7. Distribution of ACDS answers for consecutive questions according to MAQ-based medication adherence

MAQ	ACDS 1 [n; %]	ACDS 2 [n; %]	ACDS 3 [n; %]	ACDS 4 [n; %]	ACDS 5 [n; %]	ACDS 6 [n; %]	ACDS 7 [n; %]
High	4-129; 76.78%	4-131; 77.98%	4-135; 80.35%	4-126; 75.00%	4-139; 82.75%	4-88; 52.38%	4-146; 86.90%
	3-38; 22.62%	3-32; 19.05%	3-26; 15.48%	3-24; 14.28%	3-21; 12.50%	3-34; 20.23%	3-22; 13.10%
	2-1; 0.60%	2-3; 1.78%	2-5; 2.98%	2-14; 8.33%	2-6; 3.57%	2-16; 9.52%	2-0; 0.00%
	1-0; 0.00%	1-2; 1.19%	1-2; 1.19%	1-4; 2.39%	1-1; 0.59%	1-9; 5.37%	1-0; 0.00%
	0-0; 0.00%	0-0; 0.00%	0-0; 0.00%	0-0; 0.00%	0-1; 0.59%	0-21; 12.50%	0-0; 0.00%
Medium	4-10; 41.67%	4-9; 37.50%	4-10; 41.67%	4-10; 41.67%	4-11; 45.83%	4-6; 25.00%	4-14; 58.33%
	3-12; 50.00%	3-14; 58.33%	3-11; 45.83%	3-11; 45.83%	3-10; 41.6%	3-4; 16.67%	3-10; 41.67%
	2-2; 8.33%	2-0; 0.00%	2-2; 8.33%	2-1; 4.17%	2-1; 4.17%	2-4; 16.67%	2-0; 0.00%
	1-0; 0.00%	1-1; 4.17%	1-0; 0.00%	1-2; 8.33%	1-1; 4.17%	1-2; 8.33%	1-0; 0.00%
	0-0; 0.00%	0-0; 0.00%	0-1; 4.17%	0-0; 0.00%	0-1; 4.17%	0-8; 33.33%	0-0; 0.00%
Low	4-32; 57.16%	4-30; 53.57%	4-31; 55.36%	4-28; 50.00%	4-33; 58.93%	4-17; 30.36%	4-42; 75.00%
	3-20; 35.70%	3-21; 37.50%	3-15; 26.79%	3-16; 28.57%	3-17; 30.36%	3-15; 26.78%	3-8; 14.28%
	2-2; 3.57%	2-3; 5.36%	2-8; 14.29%	2-12; 21.43%	2-3; 5.36%	2-8; 14.29%	2-4; 7.15%
	1-2; 3.57%	1-2; 3.57%	1-1; 1.78%	1-0; 0.00%	1-1; 1.78%	1-7; 12.50%	1-2; 3.57%
	0-0; 0.00%	0-0; 0.00%	0-1; 1.78%	0-0; 0.00%	0-2; 3.57%	0-9; 16.07%	0-0; 0.00%

ACDS — Adherence in Chronic Disease Scale (ACDS); ACDS 1 — ACDS question no 1; MAQ — Medication Adherence Questionnaire

that the measurement corresponds to the degree to which a tool measures what it is supposed to measure. The reliability is the extent to which a measure yields the same score each time it is administered when the construct being measured has not changed [8, 19]. The ACDS is simple and quick to carry out a survey allowing the assessment of the risk of non-adherence. It helps to determine specific obstacles to medication adherence, such as: acceptance of therapy plan, cooperation between the patient and healthcare professionals, and patient economic status. This scale, designed for examining chronically ill, adult patients, was validated and subsequently used in a cardiovascular subset of patients [6, 7, 20–23]. The ability to assess the attitudes and behaviour of patients including the essential elements of the treatment process should be highlighted as strength of this scale [20]. Thus, we believe that the ACDS better reflects the actual adherence to medication compared with the MAQ, the latter addressing the issue only with a single direct question “How often do you take your medications as prescribed by the doctor?”. An in-depth analysis of the ACDS results seems to support our belief that the MAQ overestimates the rate of high adherence to medications, while it underestimates the rate of medium level of adherence. Both scores (MAQ and ACDS) rendered similar results regarding the incidence of low adherence.

Limitations of the study. Self-report tools tend to overestimate adherence, however, as our research results show, the scale of potential overestimation is not uniform for individual tools. The main limitation of this study was the inability to relate the methods of subjective adherence assessment (MAQ and ACDS) to any of the objective methods.

Conclusion

The assessment of medication adherence based on patient declarations used in the EUROASPIRE V registry is likely to overestimate the frequency of high adherence.

Conflict of interest: None.

Funding: None.

References

1. Kotseva K, De Backer G, De Bacquer D, et al. EUROASPIRE Investigators*. Lifestyle and impact on cardiovascular risk factor control in coronary patients across 27 countries: Results from the European Society of Cardiology ESC-EORP EUROASPIRE V registry. *Eur J Prev Cardiol.* 2019; 26(8): 824–835, doi: [10.1177/2047487318825350](https://doi.org/10.1177/2047487318825350), indexed in Pubmed: [30739508](https://pubmed.ncbi.nlm.nih.gov/30739508/).
2. Kubica A, Grześk G, Sinkiewicz W, et al. Compliance, concordance, adherence w przewlekłej terapii. *Folia Cardiologica Excerpta.* 2010; 5(2): 54–57.
3. Kubica A, Kasprzak M, Obońska K, et al. Discrepancies in assessment of adherence to antiplatelet treatment after myocardial infarction. *Pharmacology.* 2015; 95(1-2): 50–58, doi: [10.1159/000371392](https://doi.org/10.1159/000371392), indexed in Pubmed: [25592409](https://pubmed.ncbi.nlm.nih.gov/25592409/).
4. Pietrzykowski Ł, Kasprzak M, Michalski P, et al. The influence of patient expectations on adherence to treatment regimen after myocardial infarction. *Patient Educ Couns.* 2022; 105(2): 426–431, doi: [10.1016/j.pec.2021.05.030](https://doi.org/10.1016/j.pec.2021.05.030), indexed in Pubmed: [34059362](https://pubmed.ncbi.nlm.nih.gov/34059362/).
5. Kubica A, Kasprzak M, Siller-Matula J, et al. Time-related changes in determinants of antiplatelet effect of clopidogrel in patients after myocardial infarction. *Eur J Pharmacol.* 2014; 742: 47–54, doi: [10.1016/j.ejphar.2014.08.009](https://doi.org/10.1016/j.ejphar.2014.08.009), indexed in Pubmed: [25199965](https://pubmed.ncbi.nlm.nih.gov/25199965/).
6. Buszko K, Obońska K, Michalski P, et al. The Adherence Scale in Chronic Diseases (ASCD). The power of knowledge: the key to successful patient — health care provider cooperation. *Medical Research Journal.* 2016; 1(1): 37–42, doi: [10.5603/mrj.2016.0006](https://doi.org/10.5603/mrj.2016.0006).
7. Kubica A, Kosobucka A, Michalski P, et al. The Adherence in Chronic Diseases Scale — a new tool to monitor implementation of a treatment plan. *Folia Cardiologica.* 2017; 12(1): 19–26, doi: [10.5603/FC.a2016.0105](https://doi.org/10.5603/FC.a2016.0105).

8. Kubica A, Kosobucka A, Fabiszak T, et al. Assessment of adherence to medication in patients after myocardial infarction treated with percutaneous coronary intervention. Is there a place for new self-reported questionnaires? *Curr Med Res Opin.* 2019; 35(2): 341–349, doi: [10.1080/03007995.2018.1510385](https://doi.org/10.1080/03007995.2018.1510385), indexed in Pubmed: [30091642](https://pubmed.ncbi.nlm.nih.gov/30091642/).
9. Kosobucka A, Michalski P, Pietrzykowski Ł, et al. Adherence to treatment assessed with the Adherence in Chronic Diseases Scale in patients after myocardial infarction. *Patient Prefer Adherence.* 2018; 12: 333–340, doi: [10.2147/PPA.S150435](https://doi.org/10.2147/PPA.S150435), indexed in Pubmed: [29551891](https://pubmed.ncbi.nlm.nih.gov/29551891/).
10. Michalski P, Kasprzak M, Pietrzykowski Ł, et al. Ambulatory assessment of medication adherence in high cardiovascular-risk patients. The Polish population of the EUROASPIRE V survey. *Medical Research Journal.* 2021; 6(4): 316–321, doi: [10.5603/mrj.a2021.0053](https://doi.org/10.5603/mrj.a2021.0053).
11. Kotseva K, De Backer G, De Bacquer D, et al. EUROASPIRE V Investigators. Primary prevention efforts are poorly developed in people at high cardiovascular risk: A report from the European Society of Cardiology EURObservational Research Programme EUROASPIRE V survey in 16 European countries. *Eur J Prev Cardiol.* 2021; 28(4): 370–379, doi: [10.1177/2047487320908698](https://doi.org/10.1177/2047487320908698), indexed in Pubmed: [33966079](https://pubmed.ncbi.nlm.nih.gov/33966079/).
12. De Bacquer D, Astin F, Kotseva K, et al. EUROASPIRE IV and V surveys of the European Observational Research Programme of the European Society of Cardiology. Poor adherence to lifestyle recommendations in patients with coronary heart disease: results from the EUROASPIRE surveys. *Eur J Prev Cardiol.* 2022; 29(2): 383–395, doi: [10.1093/eurjpc/zwab115](https://doi.org/10.1093/eurjpc/zwab115), indexed in Pubmed: [34293121](https://pubmed.ncbi.nlm.nih.gov/34293121/).
13. Laskowska E, Michalski P, Pietrzykowski Ł, et al. Implementation of therapeutic recommendations in high cardiovascular-risk patients. The Polish population of EUROASPIRE V survey. *Medical Research Journal.* 2021; 6(3): 230–236, doi: [10.5603/mrj.a2021.0045](https://doi.org/10.5603/mrj.a2021.0045).
14. Lam WY, Fresco P. Medication adherence measures: an overview. *Biomed Res Int.* 2015; 2015: 217047, doi: [10.1155/2015/217047](https://doi.org/10.1155/2015/217047), indexed in Pubmed: [26539470](https://pubmed.ncbi.nlm.nih.gov/26539470/).
15. Garber MC, Nau DP, Erickson SR, et al. The concordance of self-report with other measures of medication adherence: a summary of the literature. *Med Care.* 2004; 42(7): 649–652, doi: [10.1097/01.mlr.0000129496.05898.02](https://doi.org/10.1097/01.mlr.0000129496.05898.02), indexed in Pubmed: [15213489](https://pubmed.ncbi.nlm.nih.gov/15213489/).
16. Cook CL, Wade WE, Martin BC, et al. Concordance among three self-reported measures of medication adherence and pharmacy refill records. *J Am Pharm Assoc (2003).* 2005; 45(2): 151–159, doi: [10.1331/1544345053623573](https://doi.org/10.1331/1544345053623573), indexed in Pubmed: [15868757](https://pubmed.ncbi.nlm.nih.gov/15868757/).
17. Vik SA, Maxwell CJ, Hogan DB. Measurement, correlates, and health outcomes of medication adherence among seniors. *Ann Pharmacother.* 2004; 38(2): 303–312, doi: [10.1345/aph.1D252](https://doi.org/10.1345/aph.1D252), indexed in Pubmed: [14742770](https://pubmed.ncbi.nlm.nih.gov/14742770/).
18. Wang PS, Benner JS, Glynn RJ, et al. How well do patients report non-compliance with antihypertensive medications?: a comparison of self-report versus filled prescriptions. *Pharmacoepidemiol Drug Saf.* 2004; 13(1): 11–19, doi: [10.1002/pds.819](https://doi.org/10.1002/pds.819), indexed in Pubmed: [14971118](https://pubmed.ncbi.nlm.nih.gov/14971118/).
19. Frost MH, Reeve BB, Liepa AM, et al. Mayo/FDA Patient-Reported Outcomes Consensus Meeting Group. What is sufficient evidence for the reliability and validity of patient-reported outcome measures? *Value Health.* 2007; 10(Suppl 2): S94–S104, doi: [10.1111/j.1524-4733.2007.00272.x](https://doi.org/10.1111/j.1524-4733.2007.00272.x), indexed in Pubmed: [17995479](https://pubmed.ncbi.nlm.nih.gov/17995479/).
20. Kubica A, Kosobucka A, Michalski P, et al. Self-reported questionnaires for assessment adherence to treatment in patients with cardiovascular diseases. *Medical Research Journal.* 2018; 2(4): 115–122, doi: [10.5603/mrj.2017.0015](https://doi.org/10.5603/mrj.2017.0015).
21. Kubica A, Obońska K, Fabiszak T, et al. Adherence to antiplatelet treatment with P2Y12 receptor inhibitors. Is there anything we can do to improve it? A systematic review of randomized trials. *Curr Med Res Opin.* 2016; 32(8): 1441–1451, doi: [10.1080/03007995.2016.1182901](https://doi.org/10.1080/03007995.2016.1182901), indexed in Pubmed: [27112628](https://pubmed.ncbi.nlm.nih.gov/27112628/).
22. Kubica A, Obońska K, Kasprzak M, et al. Prediction of high risk of non-adherence to antiplatelet treatment. *Kardiol Pol.* 2016; 74(1): 61–67, doi: [10.5603/KP.a2015.0117](https://doi.org/10.5603/KP.a2015.0117), indexed in Pubmed: [26101025](https://pubmed.ncbi.nlm.nih.gov/26101025/).
23. Kubica A, Adamski P, Bączkowska A, et al. The rationale for Multilevel Educational and Motivational Intervention in Patients after Myocardial Infarction (MEDMOTION) project is to support multicentre randomized clinical trial Evaluating Safety and Efficacy of Two Ticagrelor-based De-escalation Antiplatelet Strategies in Acute Coronary Syndrome (ELECTRA – SIRIO 2). *Medical Research Journal.* 2020; 5(4): 244–249, doi: [10.5603/mrj.a2020.0043](https://doi.org/10.5603/mrj.a2020.0043).