Reliability and validity of the Turkish form of the eight-item Morisky medication adherence scale in hypertensive patients

Rabia Hacıhasanoğlu Aşılar, Sebahat Gözüm[1], Cantürk Çapık[2], Donald E. Morisky[3]

Department of Nursing, Erzincan University School of Health, Erzincan-*Turkey*
[1]Department of Public Health Nursing, Akdeniz University Faculty of Nursing, Antalya-*Turkey*
[2]Department of Nursing, Kafkas University School of Health, Kars-*Turkey*
[3]Department of Community Health Sciences, UCLA Fielding School of Public Health, Los Angeles-*USA*

Abstract

Objective: The aim of this study is to evaluate the reliability and validity of the Turkish version of the 8-item Morisky medication adherence scale.
Methods: The study was conducted as a methodological design. The study included 196 patients with hypertension who applied to the Family Health Centers in three different regions of Turkey. Data were collected from February-June 2012. Methods used in the analysis included factor analysis, assessment of Cronbach's α test and item-total correlation in order to perform psychometric measurements. Variables influencing scores of medication adherence were determined using logistic regression analysis.
Results: Factor loadings of all items in the scale were above 0.40, and the variation explained was determined to be 42.4. The Turkish form consisted of a single domain. The Cronbach's α coefficient of the items in the scale was 0.79. Item-total correlations of items in the scale were between 0. 30 and 0. 62. Scores of medication adherence were observed to be affected by low economic condition and city where said individuals reside.
Conclusion: It was determined that levels of reliability and validity of Turkish version of 8-item Morisky medication adherence scale is acceptable. *(Anadolu Kardiyol Derg 2014; 14: 692-700)*
Key words: medication adherence, scale, hypertension, validity

Introduction

Hypertension is an important health problem in cerebrovascular, cardiovascular and renal diseases, since they have a major impact on premature morbidity and mortality (1, 2). The prevalence of hypertension and burden of disease caused by high blood pressure is increasing in the world (3). According to the results of PatenT study, the prevalence of hypertension in Turkey is 31.8% and 40 (4). In this study, seven per cent of these patients are aware of their condition. The rate of hypertensive subjects who receive pharmacologically treatment is 31.1% and only 8.1% of all hypertensive subjects and 20.7% of subjects who receive pharmacotherapy have their blood pressures under control. In a similar manner, the HinT study was conducted after the PatenT Study using the same population and investigated hypertension incidence (5). Results of this study identified that the 4 year incidence rate of hypertension was 21.4% and reached up to 43.3% in patients older than 65. Although the diagnosis and treatment of hypertension is easy, its management is inadequate (1). Several factors have a role in this inadequacy, including factors related to the patient and disease, the treatment regimen and physician/patient communication (6, 7). Moreover, important factors of comorbidity and advanced age like diabetes mellitus (DM) and renal failure often caused by hypertension interfere with hypertension treatment and increase complications (8). Success in hypertension management requires the determination of patients in the control and maintenance of blood pressure, adherence to non-pharmacological treatment which is recommended as much as medication and regular control visits (9).

Adherence is defined as patients' agreement to follow clinical recommendations for medication use, dietary regime or other lifestyle changes (10). Non-adherence is a major barrier to achieving adequate blood pressure control (11). Non-adherence may be affected by many factors acting either alone or in a variety of combinations. Non-adherence may occur as a result of patients' disbelief in the benefit of medication use once they feel better or worse (12); due to any side effects, cost, or number of medications used (11); poor understanding of the disease or

Address for Correspondence: Dr. Rabia Hacıhasanoğlu Aşılar, Erzincan Üniversitesi Sağlık Yüksekokulu, Hemşirelik Bölümü, Başbağlar Mahallesi 24030, Erzincan-*Türkiye* Phone: +90 446 226 58 61 Fax: +90 446 226 58 62 E-mail: rabia_hhoglu@hotmail.com
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benefits or risks of the treatment; insufficient information about medication use; transition to different formulas; or the patient's or physician's interaction with the health care system (13). In addition, not going to the clinic for regular control visits, and unhealthy habits, such as smoking, insufficient physical activity, excessive calorie intake, and consumption of food high in fat and sodium, are common and important factors that lead to non-adherence (10). Thus, interventions should be initiated to increase adherence to the treatment program by determining the factors that prevent adherence to antihypertensive medication in hypertensive patients. Nurses need to have knowledge of procedures to raise medication adherence (12). Nurses have important responsibilities in the successful management of hypertension such as providing patients with healthy lifestyle behaviors and with consultancy services for increasing their adherence to the disease and medication use (14).

One of the most fundamental elements of hypertension management is the assessment of patients' adherence to antihypertensive medication. Valid, reliable and standardized measurement tools are needed to perform this assessment as quickly and conveniently as possible. In Turkey the researchers conducted a study on the validity and reliability of the short form, one with 26 items (15) and the other with 13 items (16), which measured medication adherence in hypertensive patients. Since hypertension and medication adherence is a universal problem, it is important to increase the number of alternatives for short, comprehensible and convenient measurement tools developed for different cultures. The eight-item Morisky Medication Adherence Scale (MMAS-8), which was developed by Morisky et al. (17) in 2008 to evaluate medication adherence in hypertension patients, is a commonly used measurement tool that meets the above mentioned requirements.

This study was conducted for the purpose of assessing validity and reliability studies of Turkish version of the Morisky Medication Adherence Scale (MMAS-8) including 8 items in hypertensive patients, and to determine the medication adherence levels and the factors that affected medication adherence in hypertensive patients.

Methods

Study design

The study was conducted as a methodological design in order to evaluate the psychometric characteristics of the Turkish Version of Morisky medication adherence scale.

Sample

Research was include 196 hypertensive individuals who were registered at the Family Health Centers (FHC), which provided first line treatment, in three different regions of Turkey between February 2012 and June 2012. Descriptive questionnaire and Morisky Medication Adherence Scale together with face to face interview method were used to collect the data. The questionnaire and scale were given to participants during their visits to FHC due to physical examination, prescription or any other reason. The sample size of the study consisted of 49 participants from Antalya FHC No.18, 63 participants from Erzincan Karaağaç FHC and 84 participants from Kars Bülbül FHC. In determining the minimum sample size to be obtained from each city, the principle that "number of samples is to be 5-10 times greater than the number of items" was observed as a valid standard in sample adaptation studies (18) and the sample size for each city was ensured to be five-fold of the number of items. Since the study data were collected from individuals who applied to FHCs on Mondays and Tuesdays between February and June 2012 and who met the inclusion criteria, the number of individuals taken from each FHC differed. Inclusion criteria were being 18 years old and older, ability to communicate, having received essential hypertension diagnosis at least one year ago, and having started antihypertensive treatment; and exclusion criteria included mental retardation, psychological disorder, and pregnancy.

Study measures

Socio-demographic and descriptive factors

Age, gender, marital status, education, economic status, employing, health insurance and duration of hypertension, using antihypertensive medications, daily using medication number, comorbitidy body mass index were obtained through face to face interview. Blood pressure data were gathered as noted by the protocol presented by researchers below.

Blood pressure measurement

Researchers took measurement of blood pressure readings two times in the FHC. Blood pressures were measured at the beginning of interview. Systolic and diastolic blood pressures of right arm of the subjects were measured within 10-15 minutes during resting period while they were in seated position. Mean of two consecutive measurements taken at intervals of 5 minutes was calculated.

The subjects were asked not to use caffeine (coffee, colas) and not to smoke for at last 30 minutes before measurement of blood pressure. Control of hypertension was defined as systolic BP<140 mm Hg and diastolic BP<90 mm Hg (19). Measurements were taken using a sphygmomanometer (ERKA Brand, Perfect Anaroid Model, Serial No: 20851602). Recordings of systolic (SBP) and diastolic blood pressures (DBP) were on the basis of Korotkoff sounds.

BMI measurement

Height of the patient was measured by a tape measure when said person was standing on a horizontal floor and touching head, shoulder, hip, and heel to a straight wall. Values obtained were in centimeter (cm). Weights of patients with light clothes were measured by a standard scale. Values obtained were in kilograms (kg). In accordance with WHO standards, BMI is cal-

culated as body weight (kg)/height (m^2). If BMI values are less than 18.5, between 18.5-24.9, 25-29.9 and 30-39.9 and are 40 or more, are considered thin, normal, overweight, obese and morbidly obese, respectively (20).

Medication adherence

Self-reported antihypertensive medication adherence was determined using the eight-item MMAS-8 (17). Reason behind why this measure was designed is to enable description of barriers to and behaviors regarding adherence to chronic medications. This measure was found to be reliable (α=0.83) and considerably related to blood pressure control ($p<0.05$) in patients having hypertension (i.e, low adherence levels were caused by blood pressure control at lower rates).

Scores of the Morisky Medication Adherence Scale are between zero and eight; scores of <6, 6 to <8, and 8 are low, medium and high adherence, respectively (17). In an attempt to conduct the logistic regression analyses for determining individuals with low medication adherence, the scale scores were divided into two categories: low (scores<6) and medium or high adherence (scores≥6) (17). MMAS can be assessed in 5 or 6 minutes (17).

For measure medication adherence the Turkish form of MMAS-8 scale, which is originally developed in English, was sent by Donald E. Morisky. The English and Turkish forms of MMAS-8 were reevaluated in the panel meeting which included the investigators, an academic from the English Language and Literature Department and an expert from the Turkish Language and Literature Department, and it was decided that no modification had to be made. After the panel translation meeting period, in order to test the comprehensibility of the items, pilot application was performed in 30 individuals. Following the pilot application, psychometric measurements were initiated without making any changes in the items.

Data analysis

The demographic characteristics and mean medication adherence scores of the individuals were determined by using descriptive statistics. The demographic data and medication adherence score averages of the individuals were compared by using χ^2 and analysis of variance. In the Logistic Regression Analysis performed to determine the variables that affected medication adherence, the classifications were determined as follows: medication adherence scores below 6 were evaluated as low adherence, while scores between 6 and 8 were evaluated as moderate or high adherence; the moderate and high economic status was coded as "0" and low economic status as "1"; marital status was coded as "0" for married individuals and "1" for single ones. The codes used for the cities were "0" for Antalya, "1" for Erzincan, and "2" for Kars. While the model was set for logistic regression analysis, the variables which were assessed by χ^2 and variance analysis and which were found to be significant were included in the model. The BMI of 2 individuals diagnosed with hypertension could not be calculated because they did not want to give their weight and height details.

Data set was assessed in terms of factor analysis, Cronbach's alpha test and item-total correlation in order to perform psychometric measurements. Eigen values to be higher than 1.0, and the lowest factor load to be 0.40 were taken as the criteria to determine the most suitable construct. The results of the Kaiser-Meyer-Olkin (KMO) index applied before the psychometric measurements have shown that the sample size of this study is at a "good/sufficient" level for factor analysis (21). Before initiating the factor analysis, KMO and Barlett's tests were performed to establish the adequacy of the sample and its suitability for factor analysis. Since the scale consisted of a single-domain, no conversion method was applied. In order to determine internal reliability, Cronbach's alpha coefficient and item-total score correlations were used. SPSS 20 packet program (IBM Corporation, New York-United States) was used in psychometric measurement and group comparisons.

Ethical considerations

Before initiating the study, approval was received from Donald E. Morisky, who developed the Morisky Medication Adherence Scale, for the validity and reliability of the Turkish version. Ethics Committee approval was obtained from Ethics Committee of Erzincan University Institute of Health Sciences, official permission was received from the relevant authorities and informed consent was received from the participants who provided data for the research.

Results

General characteristics of the individuals

The average age of the hypertensive individuals included in the study was 61.8±11.4, 60.7% were women, 36.2% were primary school graduates, 54.1% were housewives, 77.6% were married, 57.7% had income equal to their expenses, 96.9% had social insurance. Hypertension was accompanied by a chronic disease in 62.2% of the individuals, 42.8% were obese/morbid obese, and 53.1% and 55.1% respectively had control systolic and diastolic blood pressure. In addition, the mean duration of hypertension among the individuals was 8.6±6.4 years, the mean duration of medication use due to hypertension was 7.8±6.3 years, and the number of medications used daily for HT disease ranged between 1 and 5 with a mean number of 1.6±0.8 (Table 1).

Construct validity

Construct validity before initiating the factor analysis, KMO and Barlet tests were conducted to determined sufficient number of the sample group size and its suitability for factor analysis. At the end of the analysis, KMO value was determined as 0.80, which was observed to be a suitable value for the analysis of essential variables. Similarly, Barlett's test results (χ^2=425.695, p=0.001) suggested that data were inter-related and suitable for factor analysis.

Table 1. General characteristics of the sample (n=196)

General characteristics		n	%
Gender	Women	119	60.7
	Men	77	39.3
Education level	Illiterate	61	31.1
	Literate	28	14.3
	Primary school, five years	71	36.2
	Secondary school, three years	13	6.6
	High school, three years	13	6.6
	University	10	5.2
Employment status	Employed	14	7.1
	Retired	52	26.5
	Housewife	106	54.1
	Unemployed	24	12.3
Marital status	Married	152	77.6
	Single	2	1.0
	Widowed/ Divorced	42	21.4
Economic status	Income<expenditure	63	32.1
	Income=expenditure	113	57.7
	Income>expenditure	20	10.2
Social assurance	Yes	190	96.9
	No	6	3.1
Comorbidity	Yes	122	62.2
	No	74	37.8
BMI (n=194)	Normal	36	18.6
	Overweight	75	38.6
	Obese	76	39.2
	Morbidly obese	7	3.6
Systolic blood pressure	Controlled	104	53.1
	Uncontrolled	92	46.9
Diastolic blood pressure	Controlled	108	55.1
	Uncontrolled	88	44.9
		Mean±SD	
Age, years		61.8±11.4	
Duration of hypertension, years		8.6±6.4	
Duration of treatment, years		7.8±6.3	
Number of medications used daily, number		1.6±0.8	

Items, factor loads, and reported variance were presented in Table 2. The factor loadings of all items were over 0.40, and the reported variation explained was 42.4. The Turkish form consisted of a single domain.

Table 2. Scale items, factor loadings and explained variance of MMAS-8 TR

Items	Factor loadings
1. Do you sometimes forget to take your high blood pressure pills?	0.72
2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your high blood pressure medication?	0.68
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	0.68
4. When you travel or leave home, do you sometimes forget to bring along your high blood pressure medications?	0.69
5. Did you take your high blood pressure medication yesterday?	0.42
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medication?	0.70
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?	0.50
8. How often do you have difficulty remembering to take all your blood pressure medication?	0.75
Explained Variance: 42.4	

Internal consistency

The Cronbach's alpha coefficient of the items in the scale was 0.79, and the item-total correlations of the items were over or equal to 0.30 (Table 3).

As shown in Table 4, the average MASES-8 scores were 5.0±2.3 and range of the scores 0-8. The majority of individuals (n=115) had low medication adherence.

As shown in Table 5, marital and economic status did affect medication adherence scores. In further analysis, it was determined that the rate of moderate and high adherence was higher in single/widowed/divorced individuals ($p<0.05$). Individuals with income less than their expenses were found to have low medication adherence ($p<0.05$). A significant difference was found between the cities in terms of medication adherence score averages. According to Dunnett's C posthoc test the reason for this difference was that medical adherence of those individuals living in Antalya was significantly higher than that of the individuals living in Kars ($p<0.05$). As shown in Table 5, medication adherence had no association with blood pressure control ($p>0.05$). As shown in Table 6, medication adherence scores of the individuals living in Antalya were 2.75 (1/0.364) times significantly higher than those of the individuals living in Erzincan. Medication adherence was found to be 3.38 (1/0.296) times significantly higher in the individuals with an income equal to expenditure or higher than income lower than expenditure ($p<0.05$).

Discussion

In this study, the validity and reliability of the Morisky Medication Adherence Scale in the Turkish language was test-

Table 3. Scale items and findings for internal validity of MMAS-8 TR

Items	Mean	Corrected item total correlation	Cronbach's α if item deleted
1. Do you sometimes forget to take your high blood pressure pills?	0.42	0.56	0.76
2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your high blood pressure medication?	0.62	0.54	0.76
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	0.70	0.55	0.76
4. When you travel or leave home, do you sometimes forget to bring along your high blood pressure medications?	0.64	0.56	0.76
5. Did you take your high blood pressure medication yesterday?	0.77	0.30	0.80
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medication?	0.65	0.56	0.76
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?	0.48	0.37	0.79
8. How often do you have difficulty remembering to take all your blood pressure medication?	0.72	0.62	0.76

Table 4. Medication adherence level of individuals

MMAS-8 scores Mean±SD: 5.0±2.3 Range 0-8		
Medication adherence level	**n**	**%**
Low adherence	115	58.7
Medium adherence	50	25.5
High adherence	31	15.8
Total	196	100.0

ed. The Bartlett Test value was determined before the assessment of factor construct and it was found to be suitable for factor analysis (χ^2=425.695, p=0.001). KMO is used to compare an observed correlation coefficient and the partial correlation coefficient, and the KMO index between 0.80 and 0.89 is accepted to be very good. In this study, KMO value was found to be 0.80, which may be considered as very good (21).

The original and the Turkish form of the eight-item scale consisted of a single domain (15). Factor loadings of all items in the scale were above 0.40, with a range between 0.42 and 0.75. The reported total variance is 42.4. Since the scale consisted of a single-domain, no conversion method was applied in the factor analysis. In its present form, the factor construct was determined to be suitable for use in the Turkish language (Appendix -1 MMAS-8-TR).

The Cronbach's alpha coefficient of MMAS-8, which was originally developed in English, was reported to be 0.83 (17). In this study, the Cronbach's alpha coefficient of MMAS-8 was found to be 0.79 and accepted to be reliable. The item-total correlations of the scale ranged between 0.30 and 0.62.

Higher scores obtained from the scale indicate higher adherence. In this study, the mean score obtained by the individuals from the Morisky Medication Adherence Scale was 5.0±2.3, which was reported as 6.6±1.6 in the original scale (17). These results demonstrate that the medication adherence of the Turkish hypertension patients is lower.

A striking finding of this study is that medication adherence did not affect blood pressure control. Although a high level of medication adherence is an important factor in maintaining blood pressure control, high medication adherence alone may not be sufficient. In this study, possible reasons why the MMAS-8 failed to be effective in controlling blood pressure may be attributed to inappropriate medication or to the inadequacy/lack of healthy lifestyle behaviors which were not questioned in the study. A randomized, and controlled experimental study conducted in Turkey reported that blood pressure control was higher in the group receiving an education on both medication adherence and healthy lifestyle behaviors than those of the group receiving education only on medication adherence (22). To achieve maximal benefit from the treatment, the subjects must make lifestyle changes besides complying with their treatment (13).

Logistic Regression Analysis was performed to determine the variables that affected medication adherence score. Three-variable construct was considered to be the most appropriate model for the logistic regression analysis. In the logistic regression model for which the cities of residence, marital and economic status of the individuals were used, it was observed that the city of residence and the unfavorable economic status affected the medication adherence scores.

Individuals living in Antalya were 2.75 (1/0.364) times significantly higher than those of the individuals living in Erzincan and medication adherence was found to be 3.38 (1/0.296) times significantly higher in the individuals with an income equal to expenditure or higher than income lower than expenditure. Protecting and improving health is directly related to various

Table 5. Comparison of some variables among low, medium and high adherence individuals

Variables	Medication adherence						Test and Sig.
	Low adherence.<6		Medium adh.6-<8		High adherence 8		
	n	%	n	%	n	%	
Gender							
Women	68	57.1	29	24.4	22	18.5	χ^2=1.642
Men	47	61	21	27.3	9	11.7	p=0.440
Marital status							
Married	91	59.9	43	28.3	18	11.8	χ^2=8.977
Single/Widowed/Divorced	24	54.6	7	15.9	13	29.5	p=0.011*
Economic status							
Income < expenditure	48	76.2	11	17.5	4	6.3	χ^2=12.475
Income >or= expenditure	67	50.4	39	29.3	27	20.3	p=0.002**
Education level							
Illiterate	37	60.6	12	19.7	12	19.7	
Literate	16	57.1	8	28.6	4	14.3	
Primary school	41	57.7	21	29.6	9	12.7	χ^2=5.313
Secondary school	9	69.2	3	23.1	1	7.7	p=0.869
High school	8	61.5	3	23.1	2	15.4	
University	4	40	3	30	3	30	
Employment status							
Employed	9	64.3	4	28.6	1	7.1	
Retired	27	51.9	14	26.9	11	21.2	χ^2=6.889
Housewife	60	56.6	28	26.4	18	17	p=0.331
Unemployed	19	79.1	4	16.7	1	4.2	
Additional chronic disease							
Yes	74	60.7	27	22.1	21	17.2	χ^2=2.061
No	41	55.4	23	31.1	10	13.5	p=0.357
BMI							
Normal	23	63.9	10	27.8	3	8.3	
Overweight	45	60	15	20	15	20	χ^2=9.181
Obese	45	59.2	20	26.3	11	14.5	p=0.164
Morbidly obese	1	14.3	4	57.1	2	28.6	
Blood pressure							
Normal	51	60.7	20	23.8	13	15.5	χ^2=0.282
HT	64	57.1	30	26.8	18	16.1	p=0.869
City	**MMAS-8 (Mean±SD)**						
Antalya	49	5.94±2.31					F=7.692
Erzincan	63	5.13±1.88					p=0.001**
Kars	84	4.37±2.46					
Systolic blood pressure							
Controlled (≤139 mm Hg)	104	5.06±2.31					t=0.327
Uncontrolled (140 mm Hg and higher)	92	4.95±2.36					p=0.744
Diastolic blood pressure							
Controlled (≤89 mm Hg)	108	5.29±2.26					t=1.914
Uncontrolled (90 mm Hg and higher)	88	4.66±2.37					p=0.057

*p<0.05, **p<0.01

Table 6. Logistic regression: prediction of likelihood of medication adherence

				95% C.I.	
	B	*P*	Odd(s)	Lower	Upper
Antalya		0.031			
Erzincan	-1.011	0.008	0.364	0.172	0.771
Kars	-0.425	0.247	0.654	0.318	1.343
Marital Status (1)*	0.288	0.430	1.334	0.653	2.725
Economic status (1)**	-1.216	0.001	0.296	0.147	0.597
Constant	1.385	0.003	3.996		

*Marital status was coded as "1" for single ones.
**Low economic status was coded as "1".

cultural and socioeconomic conditions (23). According to the most recent gross natural product data of the cities published in 2001 by The Turkish Statistical Institute, the individuals living in Antalya had 1.89 times higher income than those living in Erzincan (24). According to the Turkish Ministry of Development report updated in 2011, Erzincan ranks the 45th and Antalya ranks the 5th among 81 cities in terms of socio-economic development (25). These data suggest that the hypertensive patients in Erzincan, where income per capita is lower compared to Antalya, may have experienced difficulty in obtaining their medication. Factors like the difficulty of re-prescription, high medication prices, and patients' disbelief in the treatment are known to obstruct medication adherence (26, 27). Another reason may be the fact that individuals with low income experience more difficulty in reaching health institutions or healthcare personnel, and have less information about how to use their medication.

Study limitations

Size of sample group in the study is deemed as sufficient for validity and reliability section; however, the fact that the study has not included a larger sample group size for logistic regression analysis and other statistical analyses is a limitation of this study. Since internal consistency is affected by sample characteristics, it is important to test internal reliability for each different sample group.

Conclusion

MMAS-8-TR was determined to be a valid and reliable material. More than half of the individuals included in the study had low medication adherence, and it was concluded that medication adherence was affected by economic status and the city of residence.

Conflict of interest: None declared.

Peer-review: Externally peer-reviewed.

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APPENDIX A. Turkish Form of the Eight-Item Morisky Medication Adherence Scale MMAS-8-TR*

Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with your [high blood pressure] medication.

(Please circle the correct number) No=1 Yes=0

© Morisky Medication Adherence Scale (MMAS-8-TR)		
1. Do you sometimes forget to take your high blood pressure pills?	No	Yes
2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your high blood pressure medication?	No	Yes
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	No	Yes
4. When you travel or leave home, do you sometimes forget to bring along your high blood pressure medications?	No	Yes
5. Did you take your high blood pressure medication yesterday?	No	Yes
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medication?	No	Yes
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?	No	Yes
8. How often do you have difficulty remembering to take all your blood pressure medication?	Never/Rarely	4
	Once in a while	3
	Sometimes	2
	Usually	1
	All the time	0

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