

The Nursing Assessment of Medication Acceptance: the reliability and validity of a schizophrenia medication adherence scale

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Abstract

Background: Many patients with schizophrenia have low medication adherence. There is, however, no objective assessment scale that can be used by nurses or caregiver specialists. The Nursing Assessment of Medication Acceptance (NAMA) was developed to assess patients' medication adherence. The aim of this study was to examine the validity and reliability of the NAMA in patients with schizophrenia.

Methods: A total of 121 Japanese patients with schizophrenia were enrolled. All patients underwent evaluation using the NAMA and the Drug Attitude Inventory (DAI-10). Reliability was investigated using a test-retest method and a parallel-test method. To determine the test-retest reliability of the NAMA, we tested 101 schizophrenia patients twice, with the second assessment 2–4 weeks after the date of the first assessment. For validity verification, standard-related validity and the degree of concordance with the DAI-10 scores were measured.

Results: The Cronbach's alpha value of the NAMA in schizophrenia was 0.88. The test-retest correlation coefficients were all between 0.53–0.74. The total scores and all subscores for the NAMA were significantly correlated, and the NAMA total scores were significantly correlated with the DAI-10 total scores.

Conclusions: The NAMA shows good reliability and validity in measuring medication adherence in schizophrenia.

Keywords: adherence, NAMA, reliability, schizophrenia, validity

Introduction

Schizophrenia is a chronic disease that requires long-term pharmacotherapy. Adherence to a prescribed antipsychotic therapy is crucial for a successful treatment outcome [Lehman *et al.* 2004]. Indeed, antipsychotic medication adherence plays a key role in patients with schizophrenia, and regular treatment has been proven to ameliorate symptoms and reduce relapse rates [Dolder *et al.* 2002]. However, treatment nonadherence remains one of the greatest challenges in psychiatry [Nose *et al.* 2003]. A comprehensive review [Lacro *et al.* 2002] reported that the rate of medication nonadherence in patients with schizophrenia is as high as 40–50%.

Many patients with schizophrenia have problems adhering to their medication regimen [Elligan *et al.* 2009]. Numerous factors affect adherence, such as patient and illness characteristics; medication efficacy, tolerability and formulation; provider and system characteristics; and patients' networks. Moreover, accurately measuring adherence is challenging. Data suggest that clinicians should use multiple methods to assess patient adherence, including supplementing their own clinical judgment and patient reports with more objective measures.

Medication adherence of patients with schizophrenia needs to be determined starting in the acute

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Table 1. DAI-10.

1. For me, the good things about medications outweigh the bad.	T, F
2. I feel weird, like a 'zombie', on my medications.	T, F
3. I take medications of my own free will.	T, F
4. Medications make me feel more relaxed.	T, F
5. Medications make me feel tired and sluggish.	T, F
6. I take medications only when I am sick.	T, F
7. I feel more normal on my medications.	T, F
8. It's unnatural for my mind and body to be controlled by medications.	T, F
9. My thoughts are clearer on medication.	T, F
10. By staying on my medications, I can avoid getting sick.	T, F

DAI-10, Drug Attitude Inventory; F, false; T, true.

Table 2. NAMA.

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(1) ATTITUDE – Patient has a positive attitude toward prescribed medication. (e.g. Patient understands need for medication. Patient feels medication will be helpful. Patient feels medication will help him/her get better. Patient is insightful regarding treatment of his/her disease.)
 1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree

(2) COMPLIANCE – Patient is compliant with medication. (e.g. Patient willingly accepts prescribed medication. Patient takes medication as offered. Patient presents for medication.)
 1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree

(3) INGESTION – Patient ingests medication. (e.g. Patient has no problem swallowing medication. Patient clearly puts medication in his/her mouth and swallows it. Full dose of medication is ingested.)
 1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree

(4) NURSING EFFORT – No more nursing effort than usual was required to medicate this patient. (e.g. Patient does not have to be called repeatedly or sought out in unit. Patient spontaneously takes medication when offered, without coaxing. Patient does not need to be coaxed to place medication in his/her mouth.)
 1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree

NAMA, Nursing Assessment of Medication Acceptance.

phase, but such assessments are very difficult to perform. Although the Drug Attitude Inventory (DAI-10) (Table 1) is a simple assessment scale, it is primarily used for patients in the chronic phase and needs to be evaluated by patients themselves. To the best of our knowledge, there is no objective assessment scale designed to be administered by nurses or caregiver specialists.

The Nursing Assessment of Medication Acceptance (NAMA) (Table 2) was developed to assess patients' medication adherence. With this tool, a nurse evaluates the patient's behavior and medication acceptance. The NAMA has been used to evaluate adherence in clinical trials [Czekalla *et al.* 2007; Hori *et al.* 2009; Kinon *et al.* 2003], although this tool currently lacks scientific validation.

The aim of this study was to examine the validity and reliability of the NAMA in patients with schizophrenia.

Methods

Patients

Patients were recruited from the inpatient wards at the University of Occupational and Environmental Health, Yahatakosei Hospital, Tsutsumi Hospital, Hiagari Hospital and Minamigaoka Hospital in Japan. Patients were recruited to meet DSM-5 criteria for schizophrenia with no history of brain trauma or concurrent substance use disorder. There were no specific medication criteria for inclusion. Of the recruited schizophrenia patients, 60 of 121 were being treated with a single second-generation antipsychotic drug (aripiprazole, *n* = 19; olanzapine, *n* = 19; risperidone, *n* = 8; blonanserin, *n* = 6; paliperidone, *n* = 5; quetiapine, *n* = 2; perospirone, *n* = 1), 10 patients with a single first-generation antipsychotic drug (haloperidol, *n* = 4; chlorpromazine, *n* = 1; levomepromazine, *n* = 1; pro-periciazine, *n* = 1; zotepine, *n* = 1; sulpiride,

$n = 1$), 26 patients with two second-generation antipsychotic combination therapies, 16 patients with second-generation antipsychotic and first-generation antipsychotic combination therapy, 4 patients with two first-generation antipsychotic combination therapies, and 5 patients with more than three antipsychotic combination therapies.

This study was approved by the Ethics Committee of the University of Occupational and Environmental Health in Japan. Written informed consent was obtained from the participants.

NAMA

The NAMA was developed to assess medication adherence and acceptance (Table 2) and has been used to evaluate adherence in clinical trials [Czekalla *et al.* 2007; Hori *et al.* 2009; Kinon *et al.* 2003]. This tool is composed of the following four categories: (1) attitude, (2) compliance, (3) ingestion, and (4) nursing effort. Each category is rated on a 5-point scale (ranging from strongly agree = 1 to strongly disagree = 5), and lower scores indicate higher degrees of adherence. NAMA scores were assigned based on observations of patients' behavior and information provided by their nurses.

DAI-10

The patients' subjective attitudes to medication were measured using the DAI-10 scale (Table 1) [Hogan *et al.* 1983].

The DAI-10 is a self-report scale developed to measure subjective adherence to medication in schizophrenia. The original version of the scale consists of 30 items covering seven categories: subjective positive, subjective negative, health, illness, physician control, prevention, and harm. A shorter version consisting of 10 key items was subsequently developed (the DAI-10). These items are presented as self-report statements with which the patient agrees or disagrees. Each response is scored as +1 if correct or -1 if incorrect. The final score is the grand total of the positive and negative points. The total score can range from -10 to +10, with higher scores indicating more positive attitudes towards medication. We used the DAI-10 scale to examine how the attitudes of patients with schizophrenia towards their medications may affect their adherence. The DAI-10 has been extensively used to investigate patient adherence to antipsychotics.

The DAI-10 is concise and easy to administer, and its psychometric properties are well established. Furthermore, the scale has been shown to have test-retest reliability, high internal consistency, and discriminant, predictive, and concurrent validity [Hogan and Awad, 1992].

Brief Psychiatric Rating Scale

Symptom severity was assessed using the anchored version of the 18-item Brief Psychiatric Rating Scale (BPRS). This is a frequently used rating scale to assess the severity of a psychotic illness and is a reliable instrument. In our study, a trained medical doctor obtained BPRS ratings for all patients with schizophrenia *via* a semi-structured interview (range: 1 'not present' to 7 'very seriously present').

Procedures

From May 2015 to July 2015, 121 patients were enrolled. Researchers collected demographic data and performed semi-structured interviews to obtain clinical histories. All patients were administered the NAMA, DAI-10 and BPRS in a quiet room. To prevent fatigue and withdrawal symptoms, patients were allowed a short break of approximately 5 min or a cigarette. All participants completed each test in its entirety. After 1 month, 101 patients underwent re-evaluation using the NAMA and BPRS. The same researcher performed both the NAMA and the DAI-10 in the first and follow-up NAMA at the 1-month visit. The researcher experienced patient's medication taking in the clinical setting for at least 1 year.

Data analyses

Data analysis was conducted using STATA (STATA 12.0 package) (StataCorp, College Station, TX, USA). Descriptive statistics were used to report patients' sociodemographic and clinical data. The internal consistency and reliability of the NAMA were examined by calculating Cronbach's alpha, which describes the questionnaire's homogeneity. In general, an alpha value ≥ 0.8 was desirable. The relationships among the NAMA measures were determined by calculating Pearson's correlations among the scores. For each NAMA measure and the total score, test-retest reliability was measured with Pearson's correlations.

To test the construct validity, Pearson's correlation coefficients (r) were calculated for the NAMA

Table 3. Correlations among NAMA subscores for patients with schizophrenia.

	NAMA-2 (compliance)	NAMA-3 (ingestion)	NAMA-4 (nursing effort)	NAMA total score
NAMA-1 (attitude)	0.75****	0.59****	0.67****	0.89****
NAMA-2 (compliance)		0.67****	0.69****	0.90****
NAMA-3 (ingestion)			0.71****	0.82****
NAMA-4 (nursing effort)				0.87****

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and **** $p < 0.0001$.
NAMA, Nursing Assessment of Medication Acceptance.

among the subgroups, total scores and DAI-10 scores. For data analysis, only the NAMA scores on the first assessment were used; the NAMA scores on the second assessment were used only for the measurement of test-retest reliability.

For all subtests and total scores, test-retest reliability was measured with intra-class correlations (ICC). The ICC is a conservative estimate of test-retest reliability because it is sensitive to group mean changes over time in addition to intra-subject variability.

A value of $p < 0.05$ was considered statistically significant.

Results

A total of 121 chronic schizophrenia patients were recruited [63 males; mean age \pm standard deviation (SD): 55.3 ± 13.4 ; mean duration of illness: 28.2 ± 13.4 years]. Of the 121 patients, 101 completed all the tests. The average total BPRS score was 47.8 ± 13.5 points. The average total NAMA score was 7.2 ± 2.9 points. The time taken to complete the NAMA and the DAI-10 was 1.3 ± 0.5 min and 2.9 ± 2.3 min, respectively ($p < 0.01$).

Reliability

Cronbach's alpha for the NAMA was 0.88, which represented good internal consistency. Item-total correlations for the 4 items ranged from 0.82–0.89 (Table 3). All NAMA subscores and the total score were significantly correlated (Table 3).

Pearson's correlations between the first and second assessment (test-retest method) for each measure are given in Table 4. All NAMA

Table 4. Pearson's correlations across the first and second assessments (test-retest method).

	<i>r</i>
Attitude (NAMA-1)	0.74****
Compliance (NAMA-2)	0.65****
Ingestion (NAMA-3)	0.72****
Nursing effort (NAMA-4)	0.53****
Total score (NAMA total)	0.78****

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and **** $p < 0.0001$.
NAMA, Nursing Assessment of Medication Acceptance.

subscores and the total score were significantly correlated between the two assessments. The ICC was also calculated, and the value for the test-retest reliability of the NAMA was 0.78.

In addition, the parallel-test method was performed (two researchers administering the NAMA at the same time), and the ICC was calculated. All NAMA subscores and the total score were significantly correlated across the researcher's assessments (Table 5). The ICC for the parallel-test reliability of the NAMA was 0.61, showing a significant correlation.

Validity

Table 6 shows the Pearson's correlations among NAMA subscores and the DAI-10. The NAMA total scores were significantly correlated with the DAI-10 ($p < 0.01$).

NAMA and psychiatric symptoms

All NAMA subscores and the total score were significantly correlated with the BPRS total scores (Table 7).

Table 5. Pearson's correlations across researcher A and researcher B assessments (two researchers administering the NAMA at the same time; parallel test method).

	NAMA-1(B) Attitude	NAMA-2(B) Compliance	NAMA-3(B) Ingestion	NAMA-4(B) Nursing effort	NAMA total(B)
NAMA-1(A) Attitude	0.74****	0.62****	0.60****	0.40****	0.69****
NAMA-2(A) Compliance	0.64****	0.65****	0.66****	0.41****	0.67****
NAMA-3(A) Ingestion	0.58****	0.61****	0.72****	0.53****	0.69****
NAMA-4(A) Nursing effort	0.62****	0.63****	0.60****	0.53****	0.68****
NAMA total(A)	0.76****	0.72****	0.73****	0.53****	0.78****

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and **** $p < 0.0001$.
NAMA, Nursing Assessment of Medication Acceptance.

Table 6. Pearson's correlations for NAMA measures and DAI-10 measures.

	DAI- 10-1	DAI- 10-2	DAI-10-3	DAI- 10-4	DAI- 10-5	DAI- 10-6	DAI-10-7	DAI- 10-8	DAI- 10-9	DAI-10- 10	Total
NAMA-1 (Attitude)	-0.20*	0.05	-0.25**	-0.19*	-0.01	-0.05	-0.33***	-0.04	-0.18	-0.22*	-0.30***
NAMA-2 (Compliance)	-0.22*	-0.06	-0.13	-0.14	0.02	-0.08	-0.25**	-0.00	-0.02	-0.23*	-0.22*
NAMA-3 (Ingestion)	-0.16	-0.04	-0.17	-0.04	0.00	0.00	-0.07	-0.04	0.09	-0.17	-0.12
NAMA-4 (Nursing effort)	-0.23*	-0.03	-0.23*	-0.01	0.00	0.07	-0.10	-0.08	-0.06	-0.08	-0.15
NAMA-Total	-0.23*	-0.01	-0.23*	-0.12	0.00	-0.02	-0.24*	-0.05	-0.07	-0.21*	-0.24**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and **** $p < 0.0001$.
DAI-10, Drug Attitude Inventory; NAMA, Nursing Assessment of Medication Acceptance.

Discussion

In this study, the Cronbach's alpha coefficient of the NAMA was 0.88; because this value exceeded 0.8, the NAMA is considered to have demonstrated sufficient consistency.

In this study, test-retest analysis was performed for the NAMA with an interval of 2–4 weeks between tests, and the ICC was calculated. The ICC for the test-retest reliability of the NAMA was 0.78. In addition, a parallel test was performed (two researchers administering the NAMA at the same time), and the ICC was calculated. The ICC for the parallel test reliability of the NAMA was 0.61, showing a significant correlation. These results also indicate that the NAMA score is a stable indicator. Regarding the correlations between NAMA and DAI-10 scores,

the items regarding attitude and compliance and the total score of the NAMA correlated significantly with the total score of the DAI-10, whereas the items regarding ingestion and nursing effort did not correlate with the DAI-10. This suggests that the existing version of the DAI-10 cannot assess the items regarding ingestion and nursing effort that are on the NAMA, an assessment scale administered by nurses and caregivers. DAI-10 is mainly on the patient's attitude on medication. Therefore, it can only validate the attitude part of the NAMA. There are no perfect evaluations of the measuring adherence.

Moreover, the very short assessment time is an advantage of the NAMA, enabling many more patients to be evaluated. Achieving adherence will lead to the prevention of future recurrence,

Table 7. NAMA and psychiatric symptoms evaluated by BPRS.

	BPRS total
Attitude (NAMA-1)	0.32***
Compliance (NAMA-2)	0.31***
Ingestion (NAMA-3)	0.36****
Nursing effort (NAMA-4)	0.38****
NAMA total	0.39****

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and **** $p < 0.0001$.
BPRS, Brief Psychiatric Rating Scale; NAMA, Nursing Assessment of Medication Acceptance.

thereby improving functional outcomes. However, to date, adherence assessments have not been adequate. Furthermore, the DAI-10 suffers from certain practical issues; for instance, it cannot be used in the acute phase and must be self-administered by the patients themselves. The NAMA allows objective assessment by nurses and caregivers over a short period of time, and it can be administered in either the acute or chronic phase.

The limitations of this study include the involvement of many chronic-phase patients and the sample size. NAMA is designed to evaluate medication-compliant attitude and behavior in patients who receive their medication within a supervised medication in the clinical setting. Therefore, the generalization of these results beyond the use of the NAMA in such a population may not be appropriate.

In conclusion, the results of this study support the NAMA as a reliable and appropriate scale for measuring medication adherence in schizophrenic patients.

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Conflict of interest statement

The author declares that there is no conflict of interest.

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