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Research Progress of Measuring Tools for Patient Medication Compliance

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Abstract

This paper introduced the content, compilation process, reliability and validity, scoring method of the evaluation tool for patients' medication compliance at home and abroad, and reviewed the research progress of the tool. The evaluation method, dimension, scoring method, evaluation content and application scope of the tool were compared, so as to provide reference for nurses to comprehensively and accurately evaluate patients' medication status.

Keywords

Medication Compliance, Assessment Tool, Research Progress

1. Introduction

The World Health Organization (WHO) defines adherence as: Compliance with the recommendations of healthcare providers, including doctors, nurses and other health managers, for taking medications, making diet and lifestyle adjustments, and compliance with medication for chronic diseases in developed countries is only about 50% [1], according to the WHO. This indicates that poor medication compliance is a universal problem. Patients' poor medication compliance is affected by multiple factors, including patients' cognition of the disease, medical supervision of patients' medication use, drug use plan, educational background, social background, medical conditions, physiological and psychological factors, etc [2] [3]. Poor medication compliance behavior will not only have a multi-faceted impact on the disease, for example, it can affect patient prognosis, shorten the health span and reduce the quality of life of patients. It may also increase medical interventions, which may lead to an increased risk of adverse drug reactions and drug interactions [4]. Previous studies have shown

that non-adherence to medication may lead to 48% death in patients with asthma, 80% increased risk of death in patients with diabetes, and a 3.8-fold increased risk of death after heart attack in patients [5]. Poor medication adherence causes an annual economic loss of 125 billion euros in the European Union [6]. Therefore, early and accurate evaluation of medication compliance and intervention of poor compliance are of great significance in improving the prognosis of patients. Due to the different research objects, there may be differences in the influencing factors. This article reviews the assessment tools of patients' medication compliance, so as to provide a reference for clinical evaluation of patients' medication.

2. Medication Compliance Evaluation Tool

2.1. Morisky Medication Adherence Scale (MMAS)

Morisky Medication Adherence Scale was developed by Morisky *et al*. [7] in 1986 to evaluate the medication adherence of hypertensive patients with 4 items. Dai Junming *et al*. [8] introduced the Chinese version of MMAS-4 into China in 2000. Chinese scholar Xu Weihua [9] tested the reliability and validity of the 4-item scale in 2007, and the Cronbach α coefficient of the scale after the test was 0.749, indicating that the internal consistency was good. The 8-item scale was revised on the basis of the 4-item scale in 2008 [10]. It is widely used abroad to measure medication adherence of patients with hypertension, heart failure, diabetes and so on, and has been applied in Portugal [11], South Korea [12], Greece [13] and other countries. The 8-item scale was translated into Chinese by Si Zaixia *et al*. [14] and has good reliability and validity in the test of patients with warfarin anticoagulation after mechanical valve replacement. The Chinese version of MMAS-8 contains a total of 8 items, of which the answers to items 1 to 4 and 6 to 7 are "yes" and "no". A "no" is worth 1 point, and a "yes" is worth 0 points. Item 5 is the reverse score, the answer "yes" is worth 1 point, answer "no" is worth 0 points; The answers for item 8 were "never" (1.00), "occasionally" (0.75), "sometimes" (0.50), "often" (0.25) and "all the time" (0). Linker's 5-level scoring method was adopted. The full score on the scale was 8 points. A score < 6 was classified as low compliance, and a score ≤ 6 was classified as medium compliance. A score of 8 was classified as high compliance. Yu Ji [15] used the Chinese version of the 8-item scale to investigate the drug use of elderly patients with chronic diseases, and the results showed that clinical pharmacists took MMAS-8 as the starting point to carry out the whole process of pharmaceutical care, which could not only increase patients' understanding of drugs and diseases, but also improve the compliance and effectiveness of drug treatment. Among them, the Chinese version of the 8-item scale has been widely used in China, and is often used to investigate the medication compliance of children with acute leukemia [16], chronic myeloid leukemia [17], HIV/AIDS [18], young and middle-aged inflammatory bowel disease (IBD) [19], and elderly coronary heart disease during the hospital-family transition period [20].

2.2. 12-Item MAS (12-Item Medication Adherence Scale)

The 12-item MAS is a scale developed by Haruka *et al*. [21]. To understand the long-term adherence of patients with chronic diseases to medication, which includes four dimensions: medication adherence, medication cooperation with medical staff, willingness to acquire and use medication knowledge, and willingness to integrate medication into one's life. There are 12 items in total, and each item adopts the Likert 5-level scoring method, with 1 point for "never"; 2 points for "less"; "Sometimes" is worth 3 points; "Often" is worth 4 points; "Always" counts for 5 points, where entry 12 is scored in reverse. The scale is scored on a scale of 12 to 60 points, with higher scores indicating better medication adherence. Chinese scholar Zhang *et al*. [22] sinicized the scale in 2021 and verified it in patients with nonvalvular atrial fibrillation. The results showed that the content validity of the total volume table was 0.950, the Cronbach's α coefficient of the total volume table was 0.802, and the retest reliability was between 0.763 and 0.828, indicating good internal consistency of the scale. The scale can be used as an evaluation tool for medication compliance in patients with AF. Zhou [23] and Zhan [24] respectively tested the reliability and validity of this scale in patients with hypertension and coronary heart disease (CHD). The results showed that 12 items MAS had good reliability and validity, and could be used as an effective tool to evaluate the drug compliance of patients with hypertension and CHD. It is widely used in Canada [25] and Japan, and Japanese scholars [26] used it to investigate the medication adherence of elderly people over 65 years old. The results show that the medication adherence of elderly patients is related to good communication with doctors. The Arabic version also has good reliability and validity [27], and the scale understands patients' willingness to use drugs from multiple dimensions. However, in view of the characteristics of long-term medication for chronic diseases, the medication environment (such as whether there is family supervision) may also affect patient compliance. Due to the moderate number of items, strong operability and wide range of dimensions, it is widely used in clinical practice.

2.3. The Medication Adherence Estimation and Differentiation Scale (MEDS)

A medication adherence measurement method for patient selfmeasurement was developed by Athavale Equals [28] in 2018, consisting of 16 items in 5 dimensions. Divided into worry about side effects (4 items), worry about drug addiction (2 items), worry about drug cost (2 items), lack of drug demand (4 items), and unintentional noncompliance (4 items). The scale adopts Likert -level scoring method, with 1 point for "never"; "Occasionally" counts for 2 points; "Sometimes" is worth 3 points; "Often" is worth 4 points; "Always" counts for 5 points, with a total score of 16 to 80, and the higher the score, the worse the compliance. Cronbach's α coefficients for the five dimensions were 0.82, 0.87, 0.93, 0.91, and 0.85, respectively. Zou *et al*. [29] sinicized the scale in 2022 and investigated pa-

tients with gastroesophageal reflux disease, and the results showed that the total Cronbach's α of the scale was 0.888, the test-retest reliability was 0.950, and the content validity index was 0.97. The results indicated that the Chinese version of MEDS has good reliability and validity, and can be used for the evaluation and measurement of medication compliance of patients with gastroesophageal reflux disease in China, but it is rarely used in China.

2.4. Medication Adherence Rating Scale (MARS)

MARS was developed by Thompson *et al*. [30] on the basis of the Medication Attitude Scale (DAI) [31] and the Medication compliance Questionnaire, which is composed of two subscales, divided into the Subjective Response Scale and the Medication Adherence Scale, and includes a total of 10 self-report instruments, 1 - 4 items to assess medication adherence behavior, and 5 - 8 items to assess an individual's attitude towards taking drugs. 9 - 10 items assessing the adverse effects of medications are indicated by selecting "yes/no" with a total score on a scale of 0 to 10, with a total score of ≥6 indicating good adherence, and higher scores indicating higher medication adherence, suitable for assessment of medication adherence in patients undergoing psychotherapy. Cronbach's α coefficient is 0.800. The Sinicization of the scale by Kao *et al*. [32] included 10 items, of which the 7th and 8th items were inversely scored, and the other items were selected as "No" for 1 point, the higher the score represented the better the patient's medication compliance, the reliability of the subjective response scale and the drug compliance scale were 0.719 and 0.715, respectively, and the Cronbach's α coefficient of the total scale was 0.72, with good internal consistency. The scale is also widely used in children and parents with epilepsy, ADHD [33], diabetes mellitus [34], asthma [35], and others. The scale is a dichotomous scale, and the answers provided are two mutually exclusive answers. Therefore, subjects may encounter situations in which neither of the two answers is consistent and choose one of the answers during the self-assessment process, which may lead to inaccurate results reported.

2.5. Beliefs about Medicines Questionnaire (BMQ)

This scale is a tool developed by British scholar Horne [36] in 1999 to investigate the beliefs of patients with chronic diseases about taking medicines. The scale includes two dimensions of Specific-Necessity and Specific-Concerns, with 5 items in each dimension, all of which are scored by the Likert 5-level scoring method, with 1 point for each item from "strongly disagree". 2 points for "disagree"; "Not sure" is worth 3 points; "Agree" is worth 4 points; "Strongly agree" is worth 5 points, each dimension is scored by the total number of points/entries, and the final score ranges from 1 to 5 points. The higher the score, the higher the patient's perceived necessity (or concern) of taking medicine. Cronbach's α coefficients were 0.74 and 0.63. According to Lu *et al*. [37], the Cronbach's α coefficients of the two dimensions of medication necessity and medication concern on

BMQ in the Chinese version were 0.813 and 0.706, respectively. The retest reliability was 0.743 and 0.786, respectively, indicating good internal consistency of the scale. Fu *et al*. [38] used to investigate the compliance of prophylactic drugs in patients with cerebral infarction. The results showed that the compliance of cerebral infarction patients with secondary preventive drugs was low, so multi-faceted intervention including psychological nursing, drug education and regular telephone follow-up, in order to improve the compliance of cerebral infarction patients with secondary preventive drugs. Two questionnaires show that [39] [40] Croatian patients with early breast cancer and Polish patients with multiple sclerosis have significant differences in the first dimension, which indicates that such patients pay more attention to the necessity of drug use and less attention to the adverse reactions or other concerns of drug use. Therefore, when health education is carried out for such patients, we should focus on the necessity of medication education; In domestic and foreign research, the scale has good application effects in different research objects, so it is more used in clinical investigation.

2.6. Test of the Adherence to Inhalers (TAI)

TAI, a patient-self-rating scale developed by Plaza [41] in 2016, can not only be used to identify types of poor medication adherence in COPD and asthma patients, but also to further plan appropriate interventions and correct inadequate medication use, and has been validated with good reliability and validity in European populations [42] [43]. The scale consists of 10 items, among which items 1 to 5 are "sporadic dimension", indicating that poor patient compliance is an accidental behavior, items 6 to 10 are "intentional dimension", indicating that poor patient compliance is an intentional behavior. Likert 5-level scoring method is adopted for all items in the scale, with 1 representing always and 5 representing never. The total score is 10 to 50 points, the higher the score, the more likely it is to be, the better the medication compliance of the patient. Mend [44] carried out the Handiization of the scale and verified the chronic airway disease population in China. Cronbach's α coefficient and retest reliability of the scale were 0.843 and 0.884, indicating good reliability and validity. Yang [45] was used to investigate the status of medication compliance of COPD patients and its influencing factors, the measured reliability was 0.724. This indicates that the scale has good reliability and validity in patients with chronic airway diseases in China, and can be further applied in such people, but there is a lack of validation in other diseases. This scale was developed late and is rarely used at home and abroad.

2.7. 19-Item Rheumatic Medication Adherence Questionnaire (CQR-19)

CQR-19 is a questionnaire prepared by KLERK *et al*. [46] to understand the compliance of patients with anti-rheumatic drug therapy. The questionnaire has

good reliability and validity and is widely used in patients with rheumatism. Zhu *et al*. [47] carried out a sinicization of CQR-19, and the answer adopted the Likert 4-level scoring method: "totally disagree" is 1 point; 2 points for "disagree"; "Agree" is worth 3 points; "Strongly agree" is worth 4 points; Items 4, 8, 9, 11, 12 and 19 were scored in reverse, CCQR score (the sum of scores for each item -19)/0.57, the higher the score, the better the compliance of patients with rheumatism, and the retest reliability after sinicization was 0.994. Later scholars revised the CQR-5 of 5 items on this basis, and the revised scale Cronbach's α was 0.84, showing good internal consistency [48]. However, there is no Chinese version of the 5-item version, and the two versions are rarely used in China at present.

2.8. Adherence to Refills and Medications Scale (ARMS)

The ARMS is an adherence scale developed by Kripalani *et al*. [49] for patients with chronic diseases at a low literacy level. The scale is divided into two dimensions, involving taking medications according to prescription and regularly supplementing medications, with a total of 12 items, all of which adopt the Likert 4-level scoring method (never = 1, sometimes = 2, often = 3, always = 4). The 12th item is reverse scoring, with a total score ranging from 12 to 48 points. Score ≥ 16 points indicates poor compliance, <16 points indicates good compliance, which is widely used in foreign countries. Wu *et al*. [50] verified and optimized the Chinese version of the 10-item ARMS scale in diabetes patients. Compared with the 12-item Chinese version of the optimized 10-item ARMS scale, the Cronbach's α reliability of the 10-item ARMS scale was 0.738, and the Cronbach's α reliability of the 12-item ARMS scale was 0.731. Therefore, the Chinese version of the 10-item ARMS scale has better internal consistency reliability. The 10 items of the scale after cultural adjustment are more suitable for chronic disease patients in China. However, the two versions of the scale are rarely used in domestic studies and lack validation in patients with other diseases.

3. Comparison of Assessment Tools

3.1. Comparison of Basic Situation

With the deepening of research, the medication adherence of different research objects has been gradually paid attention to at home and abroad, and the tools for measuring medication adherence have gradually increased. The above 8 medication adherence assessment tools are all self-rating scales. Among them, 12 items of MAS and MEDS were multi-dimensional structure scales. The dimensions of MEDS included worry about drug side effects, drug cost, etc. MARS can be used to measure medication adherence behavior, as well as individual attitude to taking medication and assess the adverse effects of medication. The assessment content is extensive and takes into account all factors, which is more comprehensive than the other six assessment tools. In terms of scoring methods, reverse questions were added to the 12-item MAS, CQR-19, MMAS-8, ARMS and

MARS, which made it more convenient to know whether patients seriously understood the questions and made objective evaluation and improved the content validity.

3.2. Comparison of Application Situations

Foreign countries took the lead in studying patients' medication compliance, so the number of assessment tools gradually increased. The above 8 tools were all introduced into China by Chinese scholars. Among them, TAI and CQR-19 were developed for patients with respiratory diseases and rheumatic diseases respectively, and many countries have conducted reliability and validity tests and shown good reliability and validity. However, compared with the other general scales, the scope of use is narrow due to the limitation of research subjects. Among them, the Morisky Medication Adherence Scale and Medication Adherence Ratio Scale (MARS) have higher usage and wider applicationrange than other general scales. However, in terms of study population, they mainly focus on large base population, such as inpatients and outpatients, and there may be bias due to the heterogeneity of research subjects. Such scales need to be validated in a wide range of patients and study sites.

4. Summary and Suggestions

Foreign medication compliance assessment tools are relatively abundant, including special assessment tools for patients with diabetes, inhalation therapy, rheumatism, etc., while domestic use of assessment scales is relatively scarce. The self-assessment method of patient compliance is fast, simple and low in cost. Medical personnel can obtain the recent medication information of patients only by asking patients, including face-to-face inquiries and questionnaires. However, this method still has some shortcomings. Patients may conceal or cheat when reporting medication information to medical personnel, or deliberately beautify their medication situation to avoid criticism or other concerns from medical personnel. At the same time, since the patient is recalling the previous drug information and then reporting, it cannot be ruled out that the patient has memory confusion and other subjective errors. Moreover, each subject may have their own response style, such as a preference for very extreme options, which may cause errors in the results. In addition, none of the instruments reported the time required for the survey; The performance of the tool in the study could be affected by differences in the way the tool was implemented, such as whether the healthcare staff had been trained in the use of the tool. Therefore, the process of evaluating patients should be filled in under the guidance of professionals and after fully understanding each item. Therefore, how to understand patients' actual medication situation more objectively and truly still needs to be further explored. In order to improve the medication compliance of different patients, it is necessary to build a personalized medication plan, and reasonable drugs should be combined with correct usage to improve patients' cognition of the disease and

drugs used. The same patient may use drugs with multiple usages, such as oral, inhalation and external use, and the child's parents have insufficient professional knowledge of drugs. If necessary, patients can be guided to the pharmaceutical clinic for more detailed drug education, taking into account various influencing factors, and developing various forms of drug health education as far as possible to meet the needs of patients with different disease types, in order to improve the medication compliance of patients.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Burkhart, P.V. and Sabate, E. (2003) Adherence to Long-Term Therapies: Evidence for Action. *Journal of Nursing Scholarship*, **35**, 207. https://doi.org/10.1111/j.1547-5069.2003.tb00001.x

[2] Luo, R.L., Li, R.L., Luo, J.H., *et al.* (2023) Medication Compliance and Its Influencing Factors in Young and Middle-Aged Patients with Chronic Diseases in Dongguan Area. *Journal of Youjiang Medical College for Nationalities*, **45**, 646-651, 679.

[3] Nakwafila, O., Mashamba-Thompson, T., Godi, A. and Sartorius, B. (2022) A Cross-Sectional Study on Hypertension Medication Adherence in a High-Burden Region in Namibia: Exploring Hypertension Interventions and Validation of the Namibia Hill-Bone Compliance Scale. *International Journal of Environmental Research and Public Health*, **19**, Article 4416. https://doi.org/10.3390/ijerph19074416

[4] Li, M.Y. and Bi, L.Y. (2023) Patients with High Blood Pressure Medication Adherence Evaluation Method. *Chinese Journal of Hypertension*, **31**, 176-171.

[5] Elliott, R. (2009) Non-Adherence to Medicines: Not Solved but Solvable. *Journal of Health Services Research & Policy*, **14**, 58-61. https://doi.org/10.1258/jhsrp.2008.008088

[6] Mair, A., Wilson, M. and Dreischulte, T. (2020) Addressing the Challenge of Polypharmacy. *Annual Review of Pharmacology and Toxicology*, **60**, 661-681. https://doi.org/10.1146/annurev-pharmtox-010919-023508

[7] Morisky, D.E., Green, L.W. and Levine, D.M. (1986) Concurrent and Predictive Validity of a Self-Reported Measure of Medication Adherence. *Medical Care*, **24**, 67-74. https://doi.org/10.1097/00005650-198601000-00007

[8] Dai, J.M., Fu, H. and Shen, Y.E. (2000) Study on Medication Adherence of Essential Hypertension. *China Chronic Disease Prevention and Control*, **2000**, 143-145.

[9] Xu, W.H., Wang, Q. and Liang, W.X. (2007) Reliability and Validity of Morisky Questionnaire in Measuring Medication Adherence in Patients with Hypertension. *Chronic Disease Prevention and Control in China*, **5**, 424-426.

[10] Morisky, D.E., Ang, A., Krousel-Wood, M., *et al.* (2008) Predictive Validity of a Medication Adherence Measure in an Outpatient Setting. *The Journal of Clinical Hypertension*, **10**, 348-354. https://doi.org/10.1111/j.1751-7176.2008.07572.x

[11] De Oliveira-Filho, A.D., Morisky, D.E., Neves, S.J., *et al.* (2014) The 8-Item Morisky Medication Adherence Scale: Validation of a Brazilian-Portuguese Version in Hyper Tensive Adults. *Research in Social and Administrative Pharmacy*, **10**, 554-561. https://doi.org/10.1016/j.sapharm.2013.10.006

[12] Shin, D.S. and Kim, C.J. (2013) Psychometric Evaluation of a Korean Version of the 8-Item Medication Adherence Scale in Rural Older Adults with Hypertension. *Australian Journal of Rural Health*, **21**, 336-342. https://doi.org/10.1111/ajr.12070

[13] Maria, M., Panagiota, K., Vasileios, T., *et al.* (2023) Self-Care and Compliance with Medication and Their Relationship to the Quality of Life of Patients with Heart Failure. *Advances in Experimental Medicine and Biology*, **1425**, 417-427. https://doi.org/10.1007/978-3-031-31986-0_40

[14] Si, Z.X., Guo, L.X., Zhou, M., *et al.* (2012) Revised Morisky Medication Adherence Scale Test Reliability and Validity of Used for Patients with Anticoagulant Therapy. *Journal of Nursing and Care*, **27**, 23-26.

[15] Yu, J., Ran, S. and Xu, L. (2020) Application of Morisky Medication Adherence Scale 8 Items in Medication Evaluation of Elderly Patients with Chronic Diseases. *Journal of Clinical Drug Treatment*, **18**, 66-63.

[16] Zhong, D., Xiang, Q., Liu, Y., *et al.* (2023) Medication Adherence in Leukemia Children Receiving Home-Based Treatment and Its Related Factors. *Hematology*, **28**, Article ID: 2227490. https://doi.org/10.1080/16078454.2023.2227490

[17] Cheng, F., Cui, Z., Li, Q., *et al.* (2023) Adherence to Tyrosine Kinase Inhibitor and Clinical Outcomes in Patients with Chronic Myeloid Leukemia. *International Immunopharmacology*, **124**, Article ID: 110847. https://doi.org/10.1016/j.intimp.2023.110847

[18] Guo, H.M., Shan, H.B., Zhang, Y.N., *et al.* (2023) Study on the Relationship between Medicati on Compliance and Daily Life and Cognitive Ability in HIV/AIDS Patient. *Chinese Journal of Sexual Science*, **32**, 141-145.

[19] Yin, W.J., Zhu, B., Zhang, S., *et al.* (2023) Motivated Interview Based on the Pattern of CICARE Communication Application in Young and Middle-Aged Inflammatory Bowel Disease. *Hebei Medicine*, **45**, 2060-2064.

[20] Teng, Z.Y., Wu, J., Guo, C.X, *et al.* (2023) The Hospital Management of Elderly Patients with Coronary Heart Disease Medication—The Family Transition Deviation. *Journal of Nursing Science*, **38**, 117-120, 129.

[21] Ueno, H., Yamazaki, Y., Yonekura, Y., *et al.* (2018) Reliability and Validity of a 12-Item Medication Adherence Scale for Patients with Chronic Disease in Japan. *BMC Health Services Research*, **18**, Article No. 592. https://doi.org/10.1186/s12913-018-3380-7

[22] Zhang, L.X., Ma, L.K., Zhou, X.J., *et al.* (2021) Chinese Version of 12-Item Medication Adherence Scale and Its Reliability and Validity Test. *Zhongnan Pharmaceutical*, **19**, 302-308.

[23] Zhou, X.J., Ma, L.K., Zhang, L.X., *et al.* (2021) 12 Items Drug Compliance Assessment Scale Reliability Validity Test in Patients with Hypertension. *Journal of Nursing*, **28**, 46-49.

[24] Zhan, L., Zhang, L.X., Wei, Y., *et al.* (2023) Chinese 12 Entries Adherence Scale in Patients with Coronary Heart Disease (CHD) in the Test Reliability and Validity of. *Cardio-Cerebro Vascular Disease Prevention and Treatment*, **23**, 21-24.

[25] Bonsu, K.O., Young, S., Lee, T., Nguyen, H. and Chitsike, R.S. (2022) Adherence to Antithrombotic Therapy for Patients Attending a Multidisciplinary Thrombosis Service in Canada—A Cross-Sectional Survey. *Patient Preference and Adherence*, **16**, 1771-1780. https://doi.org/10.2147/PPA.S367105

[26] Ueno, H., Ishikawa, H., Kato, M., Okuhara, T., Okada, H. and Kiuchi, T. (2021) Factors Related to Self-Care Drug Treatment and Medication Adherence of Elderly People in Japan. *Public Health in Practice*, **2**, Article ID: 100106. https://doi.org/10.1016/j.puhip.2021.100106

[27] Alammari, G., Alhazzani, H., Alrajhi, N., Sales, I., Jamal, A., Almigbal, T.H., Batais, M.A., Asiri, Y.A. and Alruthia, Y. (2021) Validation of an Arabic Version of the Adherence to Refills and Medications Scale (ARMS). *Healthcare*, **9**, Article 1430. https://doi.org/10.3390/healthcare9111430

[28] Athavale, A.S., Bentley, J.P., Banahan III, B.F., *et al.* (2019) Development of Theme Dication Adherence Estimation and Differentiation Scale (MEDS). *Current Medical Research and Opinion*, **35**, 577-585. https://doi.org/10.1080/03007995.2018.1512478

[29] Zou, Y.Y., Cheng, F.P. and Huang, Y. (2022) Drug Compliance Assessment and Differential Scale of Localization and Evaluation. *Journal of Reliability and Validity of the Nurse Education Magazine*, **37**, 1560-1555.

[30] Thompson, K., Kulkarni, J. and Sergejew, A.A. (2000) Reliability and Validity of a New Medication Adherence Rating Scale (MARS) for the Psychoses. *Schizophrenia Research*, **42**, 241-247. https://doi.org/10.1016/S0920-9964(99)00130-9

[31] Hogan, T.P., Awad, A.G. and Eastwood, R. (1983) A Self-Report Scale Predictive of Drug Compliance in Schizophrenics: Reliability and Discriminative Validity. *Psychological Medicine*, **13**, 177-183. https://doi.org/10.1017/S0033291700050182

[32] Kao, Y.C. and Liu, Y.P. (2010) Compliance and Schizophrenia: The Predictive Potential of Insight into Illness, Symptoms, and Side Effects. *Comprehensive Psychiatry*, **51**, 557-565. https://doi.org/10.1016/j.comppsych.2010.03.007

[33] Tanveer, M., Tahir, A.H., Iqbal, M., *et al.* (2023) Health-Related Quality of Life and Medication Adherence of People Living with Epilepsy in Pakistan: A Cross-Sectional Study. *Brain and Behavior*, **13**, e3127. https://doi.org/10.1002/brb3.3127

[34] Udupa, H., Viswanath, A., Umesh Shenoy, P., *et al.* (2023) Medication Adherence in Elderly Diabetic Patients: A Cross-Sectional Study from Dakshina Kannada, India. *Cureus*, **15**, e43098 https://doi.org/10.7759/cureus.43098

[35] Cai, Q., Jin, M., Li, X., *et al.* (2023) Effect of Illness Perceptions on Asthma Control and Quality of Life Amongst Adult Outpatients with Asthma in China. *BMC Psychology*, **11**, Article No. 68. https://doi.org/10.1186/s40359-023-01097-3

[36] Horne, R., Faasse, K., Cooper, V., *et al.* (2013) The Perceived Sensitivity to Medicines (PSM) Scale: An Evaluation of Validity and Reliability. *British Journal of Health Psychology*, **18**, 18-30. https://doi.org/10.1111/j.2044-8287.2012.02071.x

[37] Lv, Y., Li, Z., Han, M.Y., *et al.* (2014) Medication Beliefs Scale in the Reliability and Validity of Chinese Version in Senile Depression Patients. *Chinese Journal of Nursing*, **49**, 393-389.

[38] Fu, X.Y., Guo, M.L., Wang, M., *et al.* (2022) Study on Secondary Prevention Medication Adherence, Social Factors, Post-Stroke Depression and Stroke Severity in Patients with Cerebral Infarction. *Chongqing Medicine*, **51**, 1753-1756, 1761.

[39] Okroša, A.D., Silovski, T., Plavetić, N.D., Silovski, H., Kovačić, A. and Mucalo, I. (2023) Beliefs about Medicines' Association with Endocrine Therapy Adherence in Early Breast Cancer Survivors in Croatia. *Acta Pharmaceutica*, **73**, 673-689. https://doi.org/10.2478/acph-2023-0043

[40] Kołtuniuk, A. and Chojdak-Łukasiewicz, J. (2023) Beliefs about Medicines and the Level of Intentional Non-Adherence to Treatment among Patients with Multiple Sclerosis Treated with First-Line Drugs. *Journal of Clinical Medicine*, **13**, Article 182. https://doi.org/10.3390/jcm13010182

[41] Plaza, V., Lopez-Vina, A. and Cosio, B.G. (2017) Test of Adherence to Inhalers. *Archivos de Bronconeumología*, **53**, 360-361. https://doi.org/10.1016/j.arbr.2017.03.005

[42] Muneswarao, J., Hassali, M.A., Ibrahim, B., *et al.* (2021) Translation and Validation of the Test of Adherence to Inhalers (TAI) Questionnaire among Adult Patients with Asthma in Malaysia. *Journal of Asthma*, **58**, 1229-1236. https://doi.org/10.1080/02770903.2020.1776728

[43] Baiardini, I., Paoletti, G., Malipiero, G., *et al.* (2020) Validation of the Italian Version of the Test of Adherence to Inhalers. *The Journal of Investigational Allergology and Clinical Immunology*, **30**, 450-452. https://doi.org/10.18176/jiaci.0536

[44] Meng, W.W., Cui, Y.N., Luo, L.J., *et al.* (2022) Reliability and Validity of the Chinese Version of T He Test of the Adherence to Inhalers (TAI). *Chinese Journal of Tuberculosis and Respiratory Diseases*, **45**, 423-430.

[45] Yang, Y.X. (2023) Study on the Relationship between Inhalant Medication Adherence and Depression, Anxiety, Self-Compassion and Coping Style in COPD Patients Based on Structural Equation Model. Master's Thesis, Yangzhou University, Yangzhou.

[46] De Klerk, E., Van Der Heijde, D., Van Der Tempel, H., *et al.* (1999) Development of a Questionnaire to Investigate Patient Compliance with Antirheumatic Drug Therapy. *The Journal of Rheumatology*, **26**, 2635-2641.

[47] Zhu, G.H., Wang, Y.Z., Tong, Z.W., *et al.* (2013) Chinese Version of Rheumatism Treatment Adherence Questionnaire Reliability and Validity of the Study. *China General Medicine*, **16**, 2805-2803.

[48] Hughes, L.D., Done, J. and Young, A. (2013) A 5 Item Version of the Compliance Questionnairefor Rheumatology (CQR5) Successfully Identifies Low Adherence to DMARDs. *BMC Musculoskeletal Disorders*, **14**, Article No. 286. https://doi.org/10.1186/1471-2474-14-286

[49] Kripalani, S., Risser, J., Gatti, M.E., *et al.* (2009) Development and Evaluation of the Adherence to Refills and Medications Scale (ARMS) among Low-Literacy Patients with Chronic Disease. *Value Health*, **12**, 118-123. https://doi.org/10.1111/j.1524-4733.2008.00400.x

[50] Wu, J.B., Tao, Z.J., Qian, C., *et al.* (2021) Optimization and Validation of the Reliability and Validity of the Refill and Medication Adherence Scale in Elderly Diabetic Patients in China. *Pharmacoepidemiology*, **30**, 706-712.