



Original Article

Development of a self-evaluation scale of nursing practices for improving sleep quality among dementia patients taking sleeping pillsYuichi Iwamoto^{1*}, Narumi Fujino², Takaomi Furuno², Yuji Fujimoto²¹School of Nursing, Faculty of Medicine, Oita University, Yufu, Japan²Department of Nursing, Faculty of Medicine, Saga University, Saga, Japan

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Yuichi Iwamoto, School of Nursing, Faculty of Medicine, Oita University, Yufu-city, Japan. E-mail: yiwamoto@oita-u.ac.jp

ABSTRACT

Background & Aim: Many patients with dementia experience sleep-related issues. However, the nursing practices that address those issues are unclear. Therefore, to develop a self-assessment scale of nursing practices to improve sleep quality in patients with dementia taking sleep medication and confirm its validity and reliability.**Methods & Materials:** In this mixed-methods study, qualitative research was conducted by interviewing six expert-level nurses with a wealth of experience in caring for patients with dementia; then, quantitative survey questions were administered. The preliminary scale was created and evaluated its face validity. This quantitative study was conducted using questionnaire surveys among nurses with psychiatric ward experience employed at dementia treatment centers across Japan. Data from 525 nurses were used to verify the validity and reliability of the scale.**Results:** Exploratory factor analysis resulted in a three-factor, 16-item scale. Criterion validity was confirmed by calculating correlation coefficients with existing scales (the self-evaluation scale of oriented problem-solving behavior in nursing practice) as external criteria ($r=0.574$, $p<.05$). The sum of scale scores and Cronbach's α coefficients for the three factors all exceeded 0.7.**Conclusion:** The development of this scale will improve the quality of nursing practice for patients with dementia who take sleeping pills. Additionally, it provides foundational research on nursing practice for the appropriate use of medications, as it offers evidence that nurses participate in drug treatment.**Introduction**

The number of patients with dementia worldwide was 57.4 million in 2019; this number is expected to reach 152.8 million by 2050 (1). The financial, social, and health-related costs of caregivers increase as symptoms of dementia become more severe (2). This burden of caregiving, coupled with the growing international costs of dementia, poses a significant challenge to the global healthcare system (3).

Sleep disturbances are closely linked to physical ailments (4). Aging is accompanied by marked changes in the sleep-wake rhythm caused by factors such as physical illness, decreased melatonin secretion, and

dysfunction of sleep-related neural pathways (5). Older adults with dementia are especially likely to fall into a lifestyle of limited socialization and minimal fluctuations in temperature or sound throughout the day owing to diminished senses, institutionalization, withdrawal from social activities, and cognitive impairment. These conditions are believed to render older adults with dementia vulnerable to circadian rhythm disturbances (6). Furthermore, many patients with dementia experience sleep disturbances (7).

These sleep-related symptoms are treated with psychotropic pharmacotherapy,



consent form, they were asked to provide the total number of nurses who could participate in the survey. Next, facilities that returned the collaboration acceptance form were mailed an appropriate number of research explanation documents and survey forms. Anonymous, self-administered questionnaires were mailed back after completion. The survey period was from June 2021 to July 2021.

Survey content

Participants' background questions included sex, age, years of nursing experience, years of experience at a dementia care center, and whether they had nursing experience in a psychiatric ward.

In addition to the 29-item preliminary scale, the survey included the self-evaluation scale of oriented problem-solving behavior in nursing practice (five-point Likert scale, 25 items) (23). This scale is used as an external standard for the development of nursing practice rating scales in Japan and comprehensively assesses nursing competence in terms of five domains (exploring and identifying patients' problems by organizing and utilizing their data; alternating medication behavior to solve and reduce patients' problems, thereby reducing their symptoms; maintaining daily living functions; personalizing care; facilitating interactions to solve patients' problems; psychological support to help patients overcome their problems; and self-evaluation to solve patients' problems), and is used as an external criterion for the development of nursing practice evaluation scales in Japan. Higher scores indicate a higher quality of daily nursing practice. Nurses caring for patients with dementia refers to the decisions and practices required in the field. The scale states that individuals engaged in nursing work need to be capable of autonomous decision-making informed by professional knowledge and skill and should integrate correct nursing practices. This scale was selected to test criterion validity because many situations require nurses to make decisions and practices in nursing practice for patients with dementia.

Analysis method

Selection of valid responses

Valid responses were those with no missing data for the 29 questions regarding nursing practices for patients with dementia who take sleeping pills.

Item analysis

The exclusion criteria for the preliminary scale were as follows: items with a ceiling (mean + standard deviation > 5) or floor effect (mean - standard deviation < 1); items for which scores did not differ between the top 25% and bottom 25% groups for the total score on the 29 items in good-poor analysis using the Mann-Whitney U test; and items with coefficients of less than 0.4 in inter-item correlation using Spearman's rank correlation coefficient and item-total analysis.

Verification of validity and reliability

An exploratory factor analysis using the maximum-likelihood method and Promax rotation was performed to verify construct validity. Items with factor loadings of 0.3 or greater across multiple factors or less than 0.4 were excluded, and the factors created were named. The number of factors was determined based on the Kaiser-Guttman criterion. The criterion for sampling adequacy was a Kaiser-Meyer-Olkin (KMO) measure of 0.8 or above.

The normality of the scale's scores for each factor and overall was evaluated using the Shapiro-Wilk test.

To verify criterion validity, correlations between the total score on the newly developed scale and the total scores on the self-evaluation scale of oriented problem-solving behavior in nursing practice were calculated using Spearman's rank correlation coefficient.

To test reliability, Cronbach's α coefficients were calculated for the overall scale and each sub-factor to confirm internal consistency. Composite reliability (CR) was calculated and examined concerning the scale's reliability.

Table 2. Item analysis of the 29 questions regarding nursing practices for improving sleep quality among dementia patients taking sleeping pills (N= 525)

No.	Item	Mean	SD	I-T correlation coefficient	G-P analysis p-value
1.	I check whether patients understand the reason for taking sleeping pills	2.8	1.1	.490	< .001
2.	I monitor for abnormal sensations (e.g., itching) in the legs as a medication side effect	3.0	1.1	.523	< .001
3.	When delirium occurs, I infer that sleeping pills are the cause	3.0	0.8	.416	< .001
4.	I monitor for anxiety symptoms before bed that make it difficult to sleep	3.7	0.8	.432	< .001
5.	<i>I adjust pillow height or bedding type as needed to improve sleep quality</i>	3.2	1.1	.489	< .001
6.	<i>I monitor for poor physical condition using objective data (e.g., blood test results, physical assessment)</i>	3.7	0.8	.533	< .001
7.	When nighttime lightheadedness occurs, I infer that sleeping pills are the cause	3.9	0.7	.236	< .001
8.	<i>If sleeplessness persists, I consider adjusting the sleeping pills together with the attending physician</i>	4.1	0.7	.408	< .001
9.	I get information about patients' participation in occupational therapy from the occupational therapist	3.7	0.9	.493	< .001
10.	I get information regarding the medication instructions given to patients from the pharmacist	2.8	1.1	.508	< .001
11.	If there is nighttime sleeplessness, I suggest the administration of as-needed medication	3.8	0.9	.236	< .001
12.	I distribute sleeping pills according to patients' administration schedules from before admission	3.1	1.1	.366	< .001
13.	If patients refuse to take sleeping pills, I respect their personal reason without forcing them to take anything	3.8	0.8	.360	< .001
14.	I place familiar objects like calendars and pictures around the bed to prepare a peaceful and recuperative environment	3.2	1.1	.541	< .001
15.	I incorporate interventions that help patients fall asleep (e.g., aromatherapy, massage) starting in the evening	1.9	0.9	.426	< .001
16.	I encourage patients to change into comfortable clothing (e.g., a nightgown) before bed	2.5	1.1	.546	< .001
17.	<i>I teach patients to avoid caffeine four hours before bed</i>	2.8	1.2	.495	< .001
18.	<i>I establish a daily rhythm by providing morning care</i>	3.8	1.0	.459	< .001
19.	I establish a circadian rhythm using indoor electric lights and sunlight	4.0	0.9	.472	< .001
20.	I incorporate reality orientation therapy (e.g., asking about the date or current location)	3.7	1.0	.543	< .001
21.	I incorporate content patients are interested in into their daytime activity program	3.4	0.8	.522	< .001
22.	When daytime sleepiness or napping occurs, I infer that sleeping pills are the cause	3.3	0.7	.282	< .001
23.	I do physical exercises and tasks together with patients to help them get out of bed during the day	3.6	0.8	.443	< .001
24.	If a patient shows a refusal to participate in their daytime activity program, I respect what they are comfortable with and do not force them	4.0	0.7	.405	< .001
25.	I set up opportunities for interaction with other patients aside from roommates	3.5	0.9	.411	< .001
26.	<i>I perform deep breathing exercises and other activities together with patients to help them consciously relax</i>	2.7	1.1	.468	< .001
27.	<i>When administering medications, I make sure to provide explanation centered on the effects of sleeping pills (e.g., "this is a medication that...")</i>	3.5	1.0	.568	< .001
28.	I set up opportunities for patients to participate in medication management as much as possible (e.g., setting out the following day's medications)	2.1	1.2	.401	< .001
29.	<i>I evaluate the effects of sleeping pills based on sleep and daytime activity</i>	3.8	0.8	.480	< .001

I-T correlation: Spearman's rank correlation coefficient, G-P analysis: Mann-Whitney U test. SD = standard deviation. Items for which all inter-item correlation coefficients were less than 0.4 = *Italics*. Items for which the I-T correlation coefficient was less than 0.4 = **Bold**.

Verification of reliability and validity

Based on the Kaiser-Guttman criterion, exploratory factor analysis was performed with three factors (maximum-likelihood method, Promax rotation). Factor analysis was repeated after excluding items with factor loadings of 0.3 or greater across

multiple factors, or less than 0.4, resulting in the exclusion of nine items for a three-factor 16-item scale. The KMO score was 0.834 ($p < .05$; Table 3). Each factor was interpreted as follows:

Factor 1 included practices related to the effective introduction of rehabilitation, such as daytime activity programs and

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occupational therapy, and was thus named *Promoting daytime activities*.

Factor 2 included practices related to preparations for high-quality sleep while using sleeping pills, such as adjusting the environment of the patient's room and providing instructions on how to take medications and was thus named *Providing a high-quality sleep environment through the appropriate use of medication*.

Factor 3 included nursing practices directly related to the use of sleeping pills, such as practices to address symptoms of

sleep disturbance and clinical reasoning in response to adverse reactions to sleeping pills, and was thus named *Considering adverse events*.

The mean score for the overall scale was 50.6 points (standard deviation: 7.6), while the mean score for each factor ranged from 12.3 to 25.8 points (standard deviation: 2.6–3.8 points). The Shapiro-Wilk test results showed that the total scores for each factor were normally distributed (Supplementary Table S1).

Table 3. Exploratory factor analysis of the self-evaluation scale of nursing practices for improving sleep quality among dementia patients taking sleeping pills (n= 411)

	Item	Factor 1	Factor 2	Factor 3	Communality
Factor 1 Promoting daytime activities: Cronbach's α=.754					
21	I incorporate content patients are interested in into their daily activity program	.647	.097	-.040	.450
20	I incorporate reality orientation therapy (e.g., asking about the date or current location)	.672	.079	.021	.439
24	If a patient shows a refusal to participate in their daytime activity program, I respect what they are comfortable with and do not force them	.580	-.207	.030	.294
23	I do physical exercises and tasks together with patients to help them get out of bed during the day	.571	.053	-.019	.357
19	I establish a circadian rhythm using indoor electric lights and sunlight	.505	.094	-.103	.246
9	I get information about patients' participation in occupational therapy from the occupational therapist	.495	-.018	.115	.297
25	I set up opportunities for interaction with other patients aside from roommates	.478	-.118	-.013	.213
Factor 2 Providing a high-quality sleep environment through the appropriate use of medication: Cronbach's α=.711					
28	I set up opportunities for patients to participate in medication management as much as possible (e.g., setting out the following day's medications)	-.140	.698	-.102	.371
16	I encourage patients to change into comfortable clothing (e.g., a nightgown) before bed	.050	.640	-.030	.407
15	I incorporate interventions that help patients fall asleep (e.g., aromatherapy, massage) starting in the evening	-.061	.554	.050	.304
14	I place familiar objects like calendars and pictures around the bed to prepare a peaceful and recuperative environment	.167	.511	.007	.358
10	I get information regarding the medication instructions given to patients from the pharmacist	.019	.419	.198	.322
Factor 3 Considering adverse events: Cronbach's α=.654					
2	I monitor for abnormal sensations (e.g., itching) in the legs as a medication side effect	-.052	.014	.797	.578
4	I monitor for anxiety symptoms before bed that make it difficult to sleep	.155	-.134	.512	.303
3	When delirium occurs, I infer that sleeping pills are the cause	-.084	.022	.464	.224
1	I check whether patients understand the reason for taking sleeping pills	-.020	.263	.430	.357
	Overall scale Cronbach's α			.801	
	Kaiser-Meyer-Olkin			.834	
	Inter-factor correlation				
	Factor 1		.392	.364	
	Factor 2			.569	

Maximum-likelihood method, Promax rotation.

Supplementary Table S1. Mean score, standard deviation, and normality testing for each factor of the self-evaluation scale of nursing practices for improving sleep quality among dementia patients taking sleeping pills (N= 525)

Item		Mean score	Standard deviation	Shapiro-Wilk test
Factor 1	Promoting daytime activities	25.8	3.8	p < .01
Factor 2	Providing a high-quality sleep environment through the appropriate use of medication	12.3	3.7	p < .01
Factor 3	Considering adverse events	12.5	2.6	p < .01

Criterion and face validity

Both total scores and subfactors of the self-evaluation scale of nursing practices for improving sleep quality among patients with dementia who take sleeping pills all showed significant correlations with the scale selected as external criteria (the self-evaluation scale of oriented problem-solving behavior in nursing practice, $r = 0.574$, $p < .05$). Moreover, face validity was confirmed by consulting an expert panel of nursing researchers.

Next, construct validity was examined concerning both convergent and discriminant validity. The average variance extracted (AVE) was used for convergent validity. The AVEs of factors were 0.323, 0.328, and 0.324, respectively. Discriminant validity was tested by comparing the squares of AVEs and factor correlations. The AVE was higher than the square of inter-factor correlations among all factors, confirming discriminant validity.

Reliability

To test reliability, Cronbach's α coefficients were calculated for the overall scale and for each sub-factor to confirm internal consistency (Table 3). The Cronbach's α for the overall scale was 0.801. In addition, The CR values (0.642–0.767) were all above the standard values, confirming the scale's reliability.

Discussion

Participant attributes and data suitability

According to the nursing professional fact-finding survey (2017) conducted by the Japanese Nursing Association with all nurses

nationwide, most nurses were aged 40–49 years (29.3%) and had 10–19 years of experience as a nurse (30.2%). Most participants were in their 40s ($n = 173$, 33%) and had an average of 19 years of experience (standard deviation: 11.2), demonstrating that participants did not differ significantly from the national average. Thus, the participants have deemed a group closely resembling the target population. Furthermore, as the total scores for each factor of the scale developed in this study were normally distributed, the data were deemed suitable for use in testing the scale's validity and reliability.

Verification of the validity and reliability of the self-evaluation scale of nursing practices for improving sleep quality among dementia patients taking sleeping pills

Construct validity

Convergent validity was below 0.5 for each factor, and construct validity remained an issue. This may be owing to the lack of a theoretical framework for nursing practice related to the appropriate use of drugs. Thus, some issues remained regarding construct validity, and further research will continue to improve the scale's accuracy through further research. The discriminative validity of the scale has been verified.

Reliability

Cronbach's α coefficients for the total scale score and the three factors were 0.801, 0.745, 0.711, and 0.654, respectively, demonstrating internal consistency and thereby confirming its reliability. Consequently, The new scale was determined to be valid and reliable for the self-evaluation of nursing practices for

improving sleep quality among patients with dementia who take sleeping pills. In addition, the CR values (0.642–0.767) were all above the standard values, confirming the reliability of the scale.

Concepts comprising nursing practices for improving sleep quality among dementia patients taking sleeping pills

Promoting daytime activities, Providing a high-quality sleep environment through the appropriate use of medication, and Considering adverse events were extracted as the three factors comprising the new scale.

Promoting daytime activities included nursing practices that encouraged daytime activities and corrected the patient's daily rhythm. It is important to spend the daytime incorporating exercise and other activities to achieve high-quality sleep at night (24). In particular, evening exercise improves daytime alertness (25). Moreover, a systematic review of non-pharmacological interventions for improving sleep quality in older adults found physical activity and sensory stimulation to be effective methods (26). As discussed at the beginning of this study, non-pharmaceutical interventions are important because of the high sensitivity of patients with dementia to medication. These nursing practices are expected to improve sleep quality and, by extension, contribute to deprescribing and reducing excessive use of hypnotics. In doing so, multidisciplinary collaboration for daytime activities, as encompassed by this factor of the scale, is essential. Patients with dementia struggle to express their wishes because of a decline in cognitive function. Therefore, it is necessary to arrange activities concerning what is comfortable for the patient to participate in without pushing themselves too hard.

Efforts to change a patient's mood through relaxation with aromatherapy or hand massage and attempts to manage medication together with patients with dementia were described as *Providing a high-quality sleep environment through the appropriate use of medication*. Non-

pharmacological interventions effectively improve symptoms, particularly for behavioral and psychological symptoms of dementia (27)—a finding that supports our current results. In addition to non-pharmacological interventions regarding the sleeping pills patients with dementia are currently taking, it is important to encourage patients to participate in medication management and to share the status of medication instruction with their pharmacist, not only to ensure accurate administration but from an ethical perspective as well. Utilizing aromatherapy and relaxation to create a peaceful environment in combination with the effective use of hypnotics can improve sleep quality among patients with dementia.

Considering adverse events included nursing practices focused on adverse events that can occur in patients with dementia who take sleeping pills. Patients with dementia are susceptible to adverse reactions to medications; however, using sleeping pills is unavoidable. The importance of paying attention to adverse events is also discussed in polypharmacy, and it is all the more important when working with patients with dementia who have a limited ability to express their wishes. NPs also emphasize monitoring in the context of drug continuation, which supports the present results. To perform these nursing practices, it is essential that nurses understand the importance of appropriate medication use and monitor patients based on their knowledge of both the effects of sleeping pills and the associated adverse events. Such practices are considered key to ensuring the safety of patients with dementia who take sleeping pills.

The nursing practices discussed thus far aim to improve sleep quality through safe and effective use of sleeping pills in combination with non-pharmacological interventions. Practicing nursing based on these perspectives and thereby securing quality sleep for patients with dementia can be expected to prevent excessive use of sleeping pills and contribute to their deprescription. Doctors and pharmacists are primarily

responsible for the appropriate use of medications; however, our results demonstrate that nurses can also contribute to the appropriate use of hypnotics in patients with dementia.

Significance and applications of the scale

As noted, dementia rates are expected to continue climbing, making it imperative to enhance nursing practices to improve sleep quality among patients with dementia who take sleeping pills. The development of this scale is significant in that it allows nurses to objectively self-evaluate their practices for improving sleep quality among patients with dementia who take sleeping pills, identifying their challenges based on the results, and improving their nursing practice. In addition to reflecting on one's own nursing practice, the scale can be used as a tool for evaluating education programs for nurses who care for patients with dementia on a daily basis, thereby contributing to the improvement of nursing care for patients with dementia. Finally, because the constructs of the scale are supported by past research, it can also be used as an evidence-based index of nursing practices.

Limitations and future directions

The survey in this study targeted nurses, and no items accounted for dementia type, severity, or stage. Additionally, the survey did not account for physical complications or mention specific sleeplessness symptoms (e.g., difficulty falling asleep and waking up during the night). This wide target population may partially explain why many items were not used for scaling in this study. For example, the rate of participation in medication management differs according to dementia severity. Therefore, it is necessary to continue research focusing on narrowing down dementia and insomnia symptoms. Further research is needed to test whether the nursing practices identified in this study can improve sleep quality in patients with dementia and promote appropriate use of sleep medication, to confirm the test-retest reliability of the scale,

and to develop a scale that would allow third-party evaluation.

Conclusion

The self-evaluation scale of nursing practices to improve sleep quality among dementia patients taking sleeping pills was developed. It comprised four factors and 16 items. Our findings confirm its validity and reliability, thus demonstrating that it is a useful tool.

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Conflict of interest

The authors declare no conflict of interest.

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