

Development of a Stroke Discharge Support Evaluation Scale for Ward Nurses in Acute Care Hospitals

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This study aimed to develop a scale enabling nurses to objectively evaluate their own stroke discharge support, as a basis for enhancing its overall effectiveness. A draft scale was created based on a literature review, and consisted of a 51-item, 5-point Likert-type questionnaire administered to ward nurses engaged in stroke discharge support at acute care hospitals. Factor analysis was performed to refine the scale. Construct validity was assessed using the known-groups method, and reliability was evaluated through internal consistency analysis. The resulting Stroke Discharge Support Evaluation Scale comprises 29 items across 5 factors, each rated on a 5-point Likert scale. Analysis of the data collected from 237 valid responses demonstrated good internal consistency and supported the scale's construct validity. The Stroke Discharge Support Evaluation Scale is a reliable and valid tool enabling ward nurses in acute care hospitals to evaluate their own stroke discharge support.

Key words: stroke, discharge support, scale development

It is crucial to reduce the recurrence rate of stroke, as stroke increases in severity with each occurrence. The risk of recurrence generally increases with age. When considering the quality of care for stroke patients, recurrence rates are often used as an indicator [1,2]. Efforts to decrease the recurrence rate require not only essential medical management, including blood pressure control, thrombosis prevention, and the management of complications, such as diabetes and dyslipidemia, but also continuous nursing care. From the perspective of providing the optimal care environment for individual patients, it is necessary to provide a continuum of nursing care: from acute care wards, where initial stroke treatment and acute rehabilitation take place, to subsequent care settings, such as post-acute rehabilitation wards, community-based integrated care

wards, and ultimately community facilities or the home. To achieve this, nurses in acute care hospitals must take the lead in promoting smooth discharge support.

Due to Japan's rapidly aging population and declining birthrate, the increasing costs of social security benefits have become a major concern. To address this, the functional differentiation of medical institutions and the strengthening of collaboration among them, coupled with policy guidance under the medical fee system, have markedly reduced the mean length of hospital stay in general hospitals in recent years <Ministry of Health, Labour and Welfare of Japan, <https://www.mhlw.go.jp/toukei/saikin/hw/kanja/20/dl/heikin.pdf> (accessed April 23, 2023)>. The importance of hospital discharge support has also been emphasized; in the 2018 revision of the medical fee system, this aspect of medical care

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was formally designated “hospital admission and discharge support” <Ministry of Health, Labour and Welfare of Japan, https://www.mhlw.go.jp/file/05-Shingikai-12601000-Seisakutoukatsukan-Sanjikanshitsu_Shakaihoshoutantou/0000203227.pdf (accessed February 2, 2022)>. While this financial incentive has played a role in promoting discharge support, it is crucial to ensure that stroke patients receive appropriate discharge support beyond simply meeting reimbursement requirements.

The goal of hospital admission and discharge support is to ensure that patients and their families lead their desired post-discharge lives safely and with peace of mind. Furthermore, discharge support aims to help patients return to their previous lives despite illness and/or disability by leveraging their own strengths and those of their families, and utilizing social resources. As reported in a previous review of the literature [3], support efforts for stroke patients are increasingly being initiated early in the hospital stay. In the 2024 revision of the medical fee system, the establishment of community-based integrated care wards was added <Ministry of Health, Labour and Welfare of Japan, <https://www.mhlw.go.jp/content/12400000/001251533.pdf> (accessed May 21, 2024)>. These wards are designed to enhance rehabilitation functions and facilitate the early discharge of elderly patients, whose hospital stays are generally prolonged. With the growing proportion of elderly among hospital patients, and more than 50% of stroke patients experiencing some form of disability, it has become increasingly critical to strengthen the discharge support system in Japan.

In terms of effective stroke discharge support, previous research has suggested the importance three main initiatives: focusing on patients with discharge difficulties; involving nurses from the early hospitalization stages to clarify patient and familial concerns and intentions regarding post-discharge; and providing discharge support through interprofessional collaboration [3]. However, with the shortening of hospital stays, the time available for each patient is limited, and it remains unclear whether the quality of discharge support is being maintained. Furthermore, there are currently no standardize tools for its evaluation.

Therefore, the purpose of this study was to develop a scale enabling nurses to objectively evaluate their own stroke discharge support as a basis for enhancing its effectiveness.

Methods

Operational definition and conceptual framework.

In the present study, we defined discharge support as “ensuring the continuity of high-quality patient care and preventing extensive and unnecessary readmissions” [4].

Additionally, we adopted Donabedian’s Quality-of-care Model [5] as the conceptual framework for this study. This model evaluates the quality of medical services in terms of Structure, Process, and Outcome. Essential quality of care has historically been evaluated by outcome measures, which in the case of stroke discharge support include the readmission rate and satisfaction with discharge support. However, outcome evaluation has been criticized for its limited ability to provide concrete measures for improvements when results are unfavorable. In contrast, process evaluation allows for accurate measurement and the identification of specific areas for improvement [6]. In this study, therefore, we adopted a process evaluation of stroke discharge support and included the following items: screening on admission, decision-making support, stroke recurrence prevention education, preparation for post-discharge care facility transition, and interprofessional collaboration. These items were categorized based on the findings of a literature review on stroke discharge support approaches [3]. The conceptual framework for the present study, based on Donabedian’s Quality-of-Care Model, is illustrated in Fig. 1.

Creation of a draft (preliminary study). In accordance with the hypothetical framework for the scale under development, we conducted a review of the relevant literature. To ensure content validity, we created an item pool of 149 statements by comprehensively collecting diverse candidate items to avoid omissions. Based on the four attributes identified in the literature review by Yano & Saito (2023) — “educational support related to knowledge of home care,” “support for behavioral changes in patients and families for relapse prevention,” “support for decision-making,” and “support for the use of medical and welfare systems” — the research team on discharge support engaged in repeated discussions to refine the list. Items deemed redundant or less relevant to stroke discharge support were removed or integrated, yielding a preliminary 51-item version of the scale.

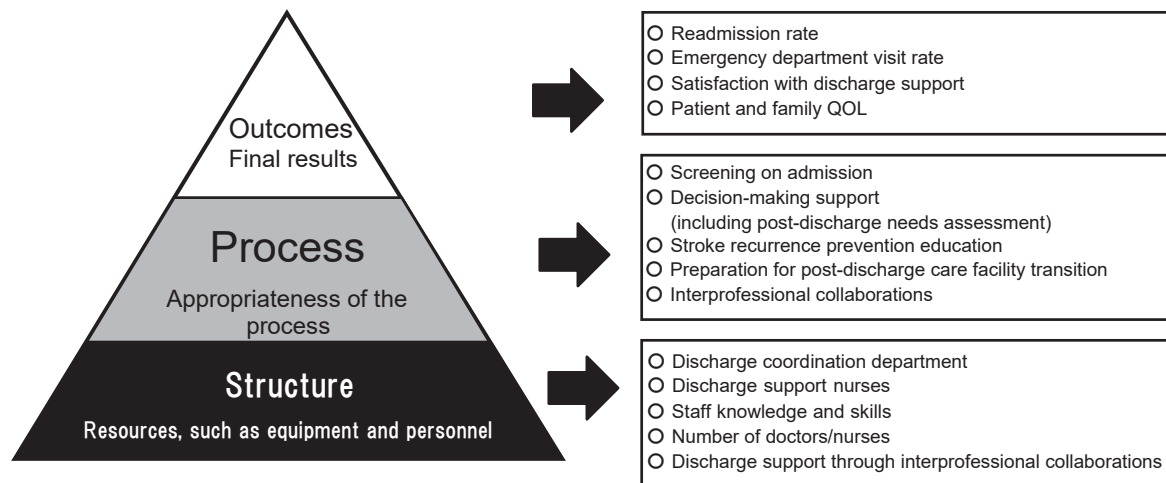


Fig. 1 Conceptual framework of stroke discharge support based on Donabedian's quality-of-care model.

As a preliminary study to confirm the content validity of this draft version, we conducted a self-administered questionnaire survey of 34 nurses working on neurosurgery/neurology wards in acute care hospitals in the Chugoku and Shikoku regions, each with at least three years of stroke discharge support experience. The scale items were rated on a 4-point Likert scale ("Unimportant," "Somewhat unimportant," "Somewhat important," and "Very important") with scores assigned from 1 to 4. We then calculated the Item-level Content Validity Index (I-CVI). Items with an I-CVI ≥ 0.78 among 3 or more experts — a threshold regarded as evidence of good content validity [7] — were retained. This process produced a 47-item draft scale across 5 subcategories.

Participants. Among acute care hospitals with neurosurgery and/or neurology wards in the Chugoku and Shikoku regions, we targeted consenting facilities with approximately 300 or more general beds, and included 450 nurses engaged in stroke discharge support at these facilities.

Survey method. The survey was conducted after obtaining approval for research cooperation from the director of nursing at each facility where the participants were employed. We sent or personally delivered the questionnaires and consent forms to the nursing directors. The participants were given one week to complete the forms, which they deposited into a designated collection box placed in the ward. The survey period was between May and August 2024.

Study items. Based on the results of researcher

meetings on the draft scale, a questionnaire survey of nurses with at least three years of experience in stroke discharge support, and the I-CVI calculation, we finalized 47 items. The response format for each item was a 5-point Likert scale: 1 = "Not implemented at all," 2 = "Not fully implemented," 3 = "Neutral," 4 = "Mostly implemented," and 5 = "Fully implemented," with scores assigned sequentially from 1 to 5.

Regarding participants' background, we included items inquiring about sex, age, years of nursing experience, years of experience in the assigned department, and non-nursing certifications.

Analysis. Collected responses that met the following conditions were regarded as valid: 1) the respondent indicated consent in the designated section of the questionnaire; and 2) the respondent completed all items of the questionnaire. We used IBM SPSS ver. 29 and IBM Amos ver. 29 for statistical analyses.

Item analysis. We performed ceiling effect, floor effect, item-total (I-T) correlation, and good-poor (G-P) analyses for each questionnaire item. A ceiling effect was defined as a mean plus standard deviation > 5 , and a floor effect as a mean minus standard deviation < 1 . Items with an I-T correlation < 0.3 were excluded as unrelated to scale construction. For the G-P analysis, participants were divided into three groups based on their responses; the top 25% and bottom 25% were used as reference groups, and *t*-tests were performed to confirm significant differences between them.

Examination of construct validity. In the exploratory factor analysis, we performed a principal compo-

nent analysis of the items organized by the item analysis, followed by a factor analysis using the principal factor method and promax rotation. We also conducted the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity to confirm the adequacy of the factor analysis, and then performed the factor analysis (using the principal factor method with promax rotation), with items with a factor loading ≥ 0.4 included and those with high loadings across multiple factors excluded.

In the confirmatory factor analysis, we created a model with the extracted factors as latent variables and the items belonging to them as observed variables, and performed a covariance structure analysis. We then evaluated the model fit using the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) to confirm construct validity, with a good model fit defined by GFI, AGFI, and CFI values ≥ 0.9 and an RMSEA value ≤ 0.05 [8].

There are two main statistical approaches to establishing validity: the criterion-related approach (criterion-related validity) and the construct-based approach (construct validity). Criterion-related validity requires reliable and valid benchmarks for comparison with the measurements obtained with the instrument [9]. However, as stated in the Introduction, there is currently no validated scale or benchmark to assess the quality of stroke discharge support. Therefore, we regarded criterion-related validity as unsuitable for this study. On the other hand, construct validity is a concept that indicates the degree to which the instrument measures the construct under investigation, and one method for verifying construct validity is the known-groups method. This method investigates whether the measurement tool differentiates between groups with expected differences in key attributes [10]. Stroke discharge support by nurses involves three main initiatives: screening for patients with potential discharge difficulties on admission; involving nurses from the early hospitalization stages to clarify patient and familial concerns and intentions regarding post-discharge; and providing discharge support through interprofessional collaboration [3]. If the measurement results distinguish differences in these nursing activities, this may provide evidence supporting the construct validity of the study scale. Therefore, we examined construct validity using the known-groups method to test the fol-

lowing two hypotheses: 1) Nurses who allocate more time to listening to patient and family concerns have higher stroke discharge support ability; and 2) Nurses who more frequently request intervention from the discharge support department when discharge support is difficult have higher stroke discharge support ability.

Examination of reliability. To confirm the internal consistency of this study, we calculated Cronbach’s α for the overall scale and each factor, with $\alpha \geq 0.7$ indicating a highly reliable scale.

Ethical considerations. This study was conducted following the ethical principles of the Declaration of Helsinki, and with the approval of the Shikoku University Research Ethics Review Committee (Approval Number: 2023012). The anonymity of individuals was ensured, and participants confirmed their consent for participation by checking the consent box in the questionnaire. Participants were provided with a written explanation of the study’s purpose and methods, the assurance of anonymity, the voluntary nature of participation, and the data management procedures.

Results

Selection of participants. We distributed the questionnaire to 450 nurses engaged in discharge support, and obtained responses from 329 (response rate: 73.1%). Following the exclusion of nurses with less than one year of experience in their assigned department, 237 nurses remained and were included in the analysis (valid response rate: 72.0%). All included participants had complete data for the 47 draft items.

Participant characteristics. The 237 participants comprised 24 (10.1%) males and 213 (89.9%) females, and the mean lengths of experience in clinical practice and stroke discharge support were 13.6 ± 10.6 and 4.1 ± 3.2 years, respectively (Table 1).

Item analysis. After identifying missing values for each of the 47 draft items among the 329 nurses who responded, we used data from the 237 nurses with no missing value for any item. We then examined ceiling and floor effects to assess response distribution biases for each item, which led to the exclusion of 12 items showing a ceiling effect: <screening for dementia on admission>, <screening for recurrent stroke on admission>, <assessing decline in activities of daily living (ADL) on admission>, <confirming application for long-term care certification on admission>, <imple-

Table 1 Overview of study participants

Participant attributes		Mean $\pm$ standard deviation	Number	%
Sex	Male		24	10.1
	Female		213	89.9
Age Group	20s		99	41.8
	30s		47	19.8
	40s		52	21.9
	50s		33	13.9
	60s		3	1.3
	No response		3	1.3
Years of Clinical Experience	1–3 years		44	18.6
	4–6 years		40	16.9
	7–9 years		29	12.2
	≥ 10 years		124	52.3
		13.6 $\pm$ 10.6		
Department (Ward)	Neurosurgery		165	69.6
	Neurology		3	1.3
	Neurosurgery and neurology		55	23.2
	Others		14	5.9
Years of Experience in Stroke Discharge Support	1–3 years		122	51.5
	4–6 years		79	33.3
	7–9 years		23	9.7
	≥ 10 years		13	5.5
		4.1 $\pm$ 3.2		
Certifications	Certified Nurse in Stroke Rehabilitation Nursing		3	
	Certified Nurse in Dysphagia Nursing		1	
	Certified Nurse in Dementia Nursing		2	
	Certified Nurse in Wound, Ostomy, and Continence Nursing		1	
	Certified Nurse Specialist in Wound Management		1	
	Certified Dementia Care Specialist		1	
	Certified Stroke Discharge and Home Care Instructor		1	

menting screening for discharge support difficulties within 3 days after admission>, <confirming the level of independence in toileting during the day and night>, <instructing the patient and caregiver to be mindful of the necessity of blood pressure>, <conducting a family meeting within 7 days and creating a discharge support plan for patients with discharge difficulties>, <holding interprofessional discharge support conferences>, <requesting interventions to the discharge support department when discharge support is difficult>, <sharing information on disease progression with the discharge coordination department>, and <sharing information on the desired post-discharge care setting with the discharge coordination department>. In contrast, there were no items exhibiting floor effects. The I-T analysis showed correlation coefficients ranging

between 0.42 and 0.71, and the G-P analysis revealed significantly higher mean scores in the upper group, confirming that no items met exclusion criteria (Table 2).

Exploratory factor analysis and factor naming.

After the exclusion of 12 items that showed a ceiling effect, we performed a principal component analysis of 35 draft items and extracted 34 items for the first principal component based on the criteria of eigenvalues > 1 and factor loadings ≥ 0.4 . The one item that did not show sufficient factor loadings (< 0.4) and was thereby excluded was <screening for respiratory infections on admission>. The KMO measure of sampling adequacy yielded a value of 0.925, and Bartlett's test of sphericity was significant at $p < 0.001$, confirming the adequacy of the factor analysis. We then performed an exploratory factor analysis using the principal factor method with

Table 2 Stroke discharge support evaluation scale Items (n=237)

Question No.	Items	Ceiling effect	Floor effect	I-T Analysis	GP Analysis		Principal component analysis factor loading
					Mean Difference	P-value	
Q7⑤	Screening for abuse on admission	4.31	2.14	.51	1.4	<.001	.587
Q9	Confirming the desired timing of discharge with the patient and family	4.77	3.09	.54	1.2	<.001	.464
Q10	Confirming the desired post-discharge living environment with the patient and family	4.94	3.40	.56	1.0	<.001	.429
Q11	Assessing the mental state of the patient with post-stroke depression	4.32	2.40	.63	1.5	<.001	.628
Q12	Having the family confirm the condition of the patient with post-stroke depression	4.16	2.18	.62	1.6	<.001	.640
Q13	Explaining coping strategies when home care is deemed difficult for the patient and family	4.66	2.74	.57	1.4	<.001	.568
Q14	Explaining emergency response procedures to the family	4.75	2.67	.57	1.5	<.001	.621
Q15	Confirming the patient's medication management ability and informing the family	4.91	3.05	.61	1.4	<.001	.580
Q17	Confirming the family's health condition	4.56	2.64	.64	1.6	<.001	.631
Q18	Confirming the family's willingness to provide care	4.74	2.96	.68	1.5	<.001	.617
Q19	Providing the family with opportunities to experience necessary ADL assistance techniques for the patient	4.07	1.93	.55	1.4	<.001	.633
Q20①	Explaining enteral nutrition when necessary and providing the family with opportunities to experience it	4.46	1.88	.48	1.5	<.001	.691
Q20②	Explaining home oxygen therapy when necessary and providing the family with opportunities to experience it	4.24	1.84	.55	1.5	<.001	.725
Q21	Allocating time to listen to concerns from the patient and family	4.64	2.80	.62	1.4	<.001	.592
Q22	Discussing and confirming the outpatient visit method with the patient and family	4.42	2.36	.65	1.7	<.001	.712
Q23	Explaining post-discharge treatment and rehabilitation to the patient and family	4.53	2.57	.70	1.7	<.001	.716
Q24	Collecting information on the postdischarge home environment (bathroom, toilet, bedroom)	4.73	2.69	.55	1.6	<.001	.595
Q25	Assessing the family's financial situation	4.04	1.94	.71	1.9	<.001	.749
Q26	Introducing medical and welfare services available after discharge	4.14	1.96	.66	1.9	<.001	.772
Q27	Explaining the usage and services of the long-term care insurance system	4.19	1.91	.63	1.9	<.001	.781
Q28	Instructing the patient and caregiver to be mindful of the necessity of hydration	4.90	3.20	.55	1.2	<.001	.480
Q30	Instructing the patient and caregiver to be mindful of the necessity of triglyceride control	4.65	2.65	.58	1.5	<.001	.611
Q31	Instructing the patient and caregiver to be mindful of the necessity of alcohol and smoking cessation	4.97	3.09	.60	1.4	<.001	.585
Q32	Instructing the patient and caregiver to be mindful of the necessity of medication selfmanagement	4.96	3.26	.57	1.2	<.001	.498
Q33	Instructing the patient and caregiver to be mindful of the necessity of weight management	4.48	2.46	.70	1.9	<.001	.736
Q34	Instructing the patient and caregiver to be mindful of the necessity of salt restriction	4.83	2.89	.63	1.6	<.001	.635
Q35	Instructing the patient and caregiver to be mindful of the necessity of exercise therapy	4.68	2.82	.70	1.6	<.001	.671
Q38	Communicating with the discharge support department, ward, and facility to shorten the waiting time before transfer	4.90	3.04	.47	1.2	<.001	.458
Q40②	Sharing information on post-discharge treatment with the discharge coordination department	4.98	3.20	.57	1.3	<.001	.519
Q40③	Sharing information on the desired timing of discharge with the discharge coordination department	4.83	3.11	.58	1.3	<.001	.511
Q40⑤	Sharing information on necessary medical and care services with the discharge coordination department	4.89	3.15	.62	1.5	<.001	.552
Q40⑥	Sharing information on the outpatient visit method with the discharge coordination department	4.71	2.65	.66	1.9	<.001	.709
Q40⑦	Sharing information on the concerns of the patient and family with the discharge coordination department	4.86	3.20	.66	1.4	<.001	.560
Q41	Having opportunities to learn about the roles of each profession to promote discharge support through interprofessional collaborations	4.43	2.31	.55	1.5	<.001	.627

promax rotation, assuming 5 factors to be extracted from the scree plot and cumulative contribution rate. With eigenvalues > 1 and factor loadings ≥ 0.4 as inclusion criteria, we excluded 5 items with factor loadings < 0.4 .

As a result, we included 29 items across 5 factors, and adopted the draft as the Stroke Discharge Support Evaluation Scale (Table 3). Based on the discharge support approaches for stroke patients provided by ward nurses, as described in the literature review by Yano & Saito [3], we designated the 5 factors as follows: Factor I: [stroke recurrence prevention education], consisting of items that summarize nurses' instructions for patients to prevent recurrent strokes; Factor II: [information sharing with the discharge coordination department], consisting of items related to information sharing between nurses and the discharge coordination department; Factor III: [preparation for post-discharge care facility transition], consisting of items necessary for patients to transition to their next care setting after discharge; Factor IV: [decision-making support], consisting of items essential for nurses to support patient decision-making; and Factor V: [providing opportunities to experience ADL assistance techniques], consisting of items related to providing families with opportunities to experience ADL assistance techniques.

Confirmatory factor analysis. We performed a confirmatory factor analysis with the 5 factors of the Stroke Discharge Support Evaluation Scale as latent variables and the 29 items belonging to each factor as observed variables, and obtained the following values: GFI=0.835, AGFI=0.801, CFI=0.928, and RMSEA=0.061 (Fig. 2).

Examination by the known-groups method. We examined construct validity using the known-groups method. The Kruskal-Wallis test revealed a significant difference in the relationship between <Nurses who allocate more time to listening to patient and family concerns have higher stroke discharge support ability> and total scores of the Stroke Discharge Support Evaluation Scale ($H(4)=90.733$, $p<0.001$). Furthermore, multiple comparisons using the Bonferroni method showed that nurses who responded "fully implemented" had significantly higher stroke discharge support ability than those who answered "mostly implemented," "neutral," "not fully implemented," or "not implemented at all" ($p<0.001$) (Table 4).

Similarly, a one-way analysis of variance to clarify

the relationship between "requesting interventions to the discharge support department" and the total score of the Stroke Discharge Support Evaluation Scale revealed significant differences ($F=10.566$, $p<0.05$). Furthermore, multiple comparisons using the Tukey HSD test showed that the total scale score was higher among nurses answering "Fully implemented" than those answering "Not implemented at all" (Table 5).

Examination of reliability. Cronbach's α was 0.917 for Factor I, 0.882 for Factor II, 0.886 for Factor III, 0.865 for Factor IV, and 0.842 for Factor V, and 0.947 for the overall scale.

Discussion

Validity and reliability of the stroke discharge support evaluation scale. To ensure content validity, we developed a scale that adopted a care quality evaluation framework [5] with reference to the literature review by Yano & Saito [3] on nurse-led discharge support, and obtained approval from stroke discharge support researchers through repeated discussions. In addition, we conducted a preliminary survey of nurses with more than three years of experience in stroke discharge support, and included items with an I-CVI ≥ 0.78 —a threshold regarded as evidence of good content validity—to ensure content validity [7].

We excluded 12 items that showed a ceiling effect in the item analysis. These items may be common components of discharge support across various diseases and thus may represent general discharge support tasks performed by nurses. Therefore, we removed the 12 items from the scale in order to simplify the stroke discharge support evaluation by nurses; however, the excluded items may still be useful in clinical practice as general discharge support tasks.

The I-T analysis showed that all items exceeded the exclusion criterion of < 0.4 , confirming their validity.

The principal component analysis revealed that the loadings of 34 items for the first principal component were > 0.4 . Many variables showed high loadings on the first principal component, confirming that this component integrated the 34 variables involved in the Stroke Discharge Support Evaluation scale. We examined construct validity by an exploratory factor analysis, confirmatory factor analysis, and the known-groups method [10]. Although the draft consisted of 6 subconcepts, the final scale has a 5-factor structure based on the

Table 3 Results of the stroke patient discharge support evaluation scale (n = 237)

Items		Factor				
		I	II	III	IV	V
Factor I (7 items): Stroke Recurrence Prevention Education $\alpha = .917$						
Q34	Instructing the patient and caregiver to be mindful of the necessity of salt restriction	.95	-.01	.02	-.17	.02
Q31	Instructing the patient and caregiver to be mindful of the necessity of alcohol and smoking cessation	.91	.00	-.13	.01	.01
Q35	Instructing the patient and caregiver to be mindful of the necessity of exercise therapy	.81	.03	.05	-.04	.05
Q30	Instructing the patient and caregiver to be mindful of the necessity of triglyceride control	.79	-.02	.03	.00	-.06
Q33	Instructing the patient and caregiver to be mindful of the necessity of weight management	.74	.03	.14	-.08	.06
Q32	Instructing the patient and caregiver to be mindful of the necessity of medication self-management	.73	.12	-.22	.12	-.01
Q28	Instructing the patient and caregiver to be mindful of the necessity of hydration	.52	-.07	.04	.21	-.05
Factor II (6 items): Information Sharing with the Discharge Coordination Department $\alpha = .882$						
Q40⑤	Sharing information on necessary medical and care services with the discharge coordination department	-.02	.86	.05	-.07	.05
Q40②	Sharing information on post-discharge treatment with the discharge coordination department	.00	.76	-.04	.05	.01
Q40③	Sharing information on the desired timing of discharge with the discharge coordination department	-.02	.75	-.09	.18	-.04
Q40⑦	Sharing information on the concerns of the patient and family with the discharge coordination department	.13	.65	.07	.05	-.05
Q40⑥	Sharing information on the outpatient visit method with the discharge coordination department	.03	.58	.32	-.07	.01
Q38	Communicating with the discharge support department, ward, and facility to shorten the waiting time before transfer	.02	.51	.01	-.02	.14
Factor III (6 items): Preparation for Post-Discharge Care Facility Transition $\alpha = .886$						
Q26	Introducing medical and welfare services available after discharge	-.13	.03	.92	-.12	.14
Q27	Explaining the usage and services of the long-term care insurance system	-.13	.03	.89	-.09	.11
Q25	Assessing the family's financial situation	.11	.07	.74	-.05	-.01
Q22	Discussing and confirming the outpatient visit method with the patient and family	.03	-.02	.64	.18	-.09
Q23	Explaining post-discharge treatment and rehabilitation to the patient and family	.17	-.10	.56	.23	-.05
Q24	Collecting information on the post-discharge home environment (bathroom, toilet, bedroom)	.07	.08	.53	.16	-.22
Factor IV (7 items): Decision-Making Support $\alpha = .865$						
Q10	Confirming the desired post-discharge living environment with the patient and family	-.12	.20	-.16	.81	-.05
Q9	Confirming the desired timing of discharge with the patient and family	-.08	.06	-.08	.78	-.02
Q12	Having the family confirm the condition of the patient with post-stroke depression	.06	-.11	-.02	.61	.28
Q11	Assessing the mental state of the patient with post-stroke depression	.13	-.12	.04	.56	.17
Q18	Confirming the family's willingness to provide care	.07	.04	.20	.55	-.05
Q13	Explaining coping strategies when home care is deemed difficult for the patient and family	.02	-.05	.16	.52	.05
Q17	Confirming the family's health condition	.08	.01	.18	.51	-.03
Factor V (3 items): Providing Opportunities to Experience ADL Assistance Techniques $\alpha = .842$						
Q20①	Explaining enteral nutrition when necessary and providing the family with opportunities to experience it	-.03	.08	-.06	.00	.85
Q20②	Explaining home oxygen therapy when necessary and providing the family with opportunities to experience it	.07	-.02	.06	-.02	.82
Q19	Providing the family with opportunities to experience necessary ADL assistance techniques for the patient	-.06	.06	.07	.22	.53
Overall scale reliability: Cronbach's $\alpha = .947$						
Factor contribution rate (%)		41.2	8.2	6.5	5.4	4.5
Cumulative contribution rate (%)		41.2	49.4	55.9	61.3	65.8

Factor extraction method: Principal factor method.

Rotation method: Promax rotation with Kaiser normalization.

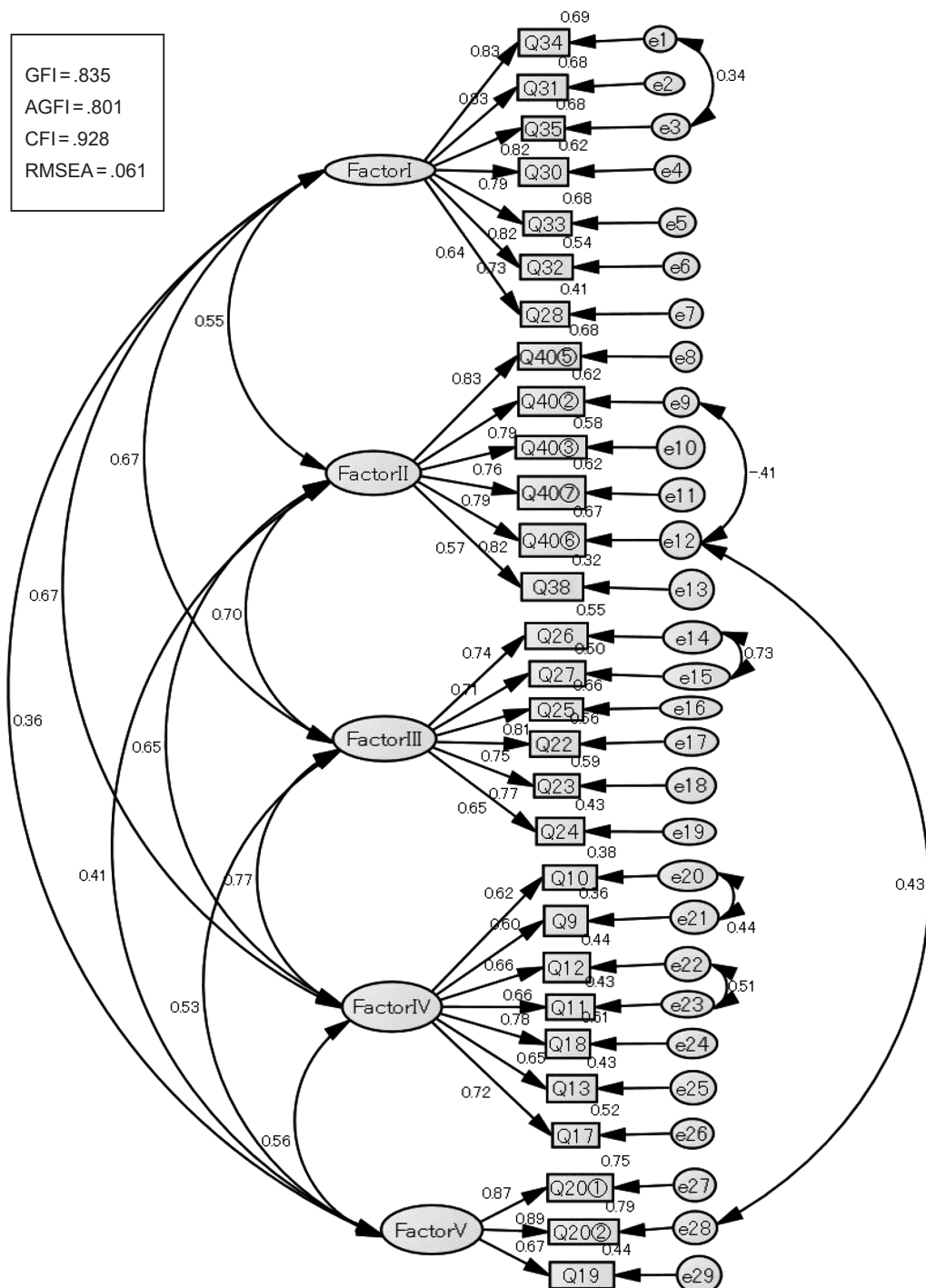
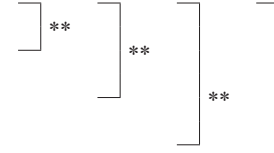


Fig. 2 Results of a confirmatory factor analysis: After model modification.

Table 4 Total score of the stroke discharge support evaluation scale

Allocating time to listen to concerns from the patient and family	Score of the stroke discharge support evaluation scale			Standard deviation	Number
	Mean				
1. Fully implemented	125.2		14.5	45	
2. Mostly implemented	106.0		13.7	110	
3. Neutral	96.0		13.2	56	
4. Not fully implemented	91.4		14.7	23	
5. Not implemented at all	65.0		6.0	3	

** $p < .001$ (Kruskal-Wallis test result).

Table 5 Total score of the stroke discharge support evaluation scale and intervention requests to the discharge support department

Requesting an intervention to the discharge support department when discharge support is difficult	Total score of the stroke discharge support evaluation scale			
	Mean		Standard deviation	Number
Fully implemented	110.3	* ** *]	18.8	130
Mostly implemented	102.2		14.2	78
Neutral	92.4		14.1	24
Not fully implemented	90.0		20.1	5

* $p < .05$ ** $p < .001$ (Tukey HSD test result)

results of the present study. Furthermore, comparisons of the results of the exploratory factor analysis and the hypothetical frameworks based on the 6 subconcepts confirmed the following relationships between the final factor structure and the hypothetical framework: Factor I [stroke recurrence prevention education] corresponds to the hypothetical framework category of the same name; Factor II [information sharing with the discharge coordination department] comprises the hypothetical framework [interprofessional collaboration]; Factor III [preparation for post-discharge care facility transition] comprises the hypothetical framework of the same name; and Factor V [providing opportunities to experience ADL assistance techniques] comprises the hypothetical framework [preparation for post-discharge care facility transition]. On the other hand, Factor IV [decision-making support] integrates 5 items of the hypothetical framework [decision-making support] and 1 item, <confirming the family's health condition>, of the hypothetical framework [prepara-

tion for post-discharge care facility transition]. In a previous study, ward nurses were reported to analyze the safety of home life during the discharge support process, and to assess the burden of caregiving based on the caregiver's age and health condition to determine whether they could handle the required level of care [11]. This highlights the importance of <confirming the family's health condition> as part of [preparation for post-discharge care facility transition] with nurses supporting patient and family decision-making.

There were significant differences among nurses in the total scores of the Stroke Discharge Support Evaluation Scale for <Nurses who allocate more time to listening to patient and family concerns> and <requesting interventions to the discharge support department>, with higher scores being observed among those with a higher implementation rate and those with a high frequency of intervention requests. These results support the two hypotheses: “Nurses who allocate more time to listening patient and family concerns have a higher

stroke discharge support ability” and “Nurses who more frequently request intervention from the discharge support department when discharge support is difficult have a higher stroke discharge support ability”.

In discharge support provided by nurses, communication with patients and their families plays an important role and has been shown to significantly impact quality of life after discharge [12]. Based on this finding, dedicating time to listen to the concerns of patients and their families was regarded as an indicator of high competence in stroke discharge support and was therefore included as an indicator. Additionally, it has been reported that liaison nurses in acute care hospitals play a key role in ensuring continuity of care for older adults when they are transferred from acute care hospitals to community hospitals by facilitating communication between institutions [13]. In light of this, in acute care settings where discharge support must be provided within a limited time frame, it was considered important for ward nurses “to request intervention from the discharge support department when discharge planning becomes difficult.” This practice was therefore adopted as an indicator to support patients’ lives in the community. These findings suggest that the Stroke Discharge Support Evaluation Scale can distinguish between groups that differ in attributes known to be important for stroke discharge support, thereby supporting its construct validity.

The goodness of fit of the model in the confirmatory factor analysis was $GFI=0.835$, $AGFI=0.801$, $CFI=0.928$, and $RMSEA=0.061$. Although GFI and $AGFI$ did not reach the desirable threshold of 0.9, they were close to this value, and $RMSEA$ remained <0.1 , indicating an acceptable fit. When pursuing the goodness of fit of a model by reducing the number of observed variables, there is a possibility that only items included in specific situations or behavioral categories will remain, resulting in a narrow and biased set of variables that may not comprehensively measure the intended content domain, ultimately reducing validity [14]. Therefore, in a practical analysis, a well-balanced model that avoids extreme deviations in fit index values is considered optimal [15]. Based on these considerations, the scale was deemed to have established a certain level of construct validity.

Regarding the reliability of this scale, Cronbach’s α was 0.947 for the overall scale, exceeding the commonly accepted threshold of 0.7 for internal consistency,

indicating a high level of reliability.

Therefore, the content validity, construct validity, and reliability of this scale were confirmed to be within statistically acceptable ranges.

Components of the scale. The present study aimed to develop a scale for ward nurses in acute care hospitals to evaluate their own stroke discharge support. The following paragraphs discuss the significance of self-evaluating stroke patient discharge support competency using this scale.

Stroke discharge support is characterized by placing importance on stroke education and recurrence prevention [16], and [stroke recurrence prevention education] in the present study was considered to be a core factor in such support based on its item contents. These item contents represent the educational interventions provided by nurses to patients [3], and may serve as key indicators for supporting patients in self-monitoring after discharge, which is crucial for preventing stroke recurrence [17,18]. Self-monitoring by patients is effective when supported by healthcare professionals [19]. Therefore, incorporating stroke recurrence prevention education into this scale is essential for ensuring appropriate stroke discharge support.

[Information sharing with the discharge coordination department] reflects the reality that stroke patients and their families often face discharge with anxiety due to shortened hospital stays [3]. This situation highlights the importance of information sharing between ward nurses and the discharge coordination department. In the discharge coordination department, discharge coordination nurses and social workers facilitate patient discharge planning. Therefore, in discharge coordination performed by nurses and facilitated by interprofessional collaboration [3], supporting discharge through interprofessional collaboration while addressing the concerns of patients and their families is crucial.

[Preparation for post-discharge care facility transition] indicates that patients receiving care and their families are supported through the provision of information on post-discharge rehabilitation, available medical and welfare services, and a suitable housing environment. Caregiving significantly affects the physical and mental well-being of family members, who are often heavily involved in the provision of care. Therefore, it is essential for caregivers to understand the patient’s medical condition, rehabilitation needs, and available healthcare services, while also assessing

their own caregiving capacity [20,21]. Furthermore, since nurses need to assess whether home care is sustainable for a long period of time in each case [22], helping inpatients prepare for a smooth transition to the next care setting is an important nursing role.

[Decision-making support] involves an assessment of the patient's desired place of living after discharge and their mental state, including post-stroke depression, as well as the confirmation of the family's health status. This suggests that as patients transition from the acute phase to the post-acute rehabilitation phase, families generally begin to consider care settings and discharge timing. Stroke recovery interventions typically occur during the subacute phase, spanning from a few days to weeks after stroke onset [23]. During this period, while rehabilitation often leads to symptom improvement, the severity of functional impairment or higher brain dysfunction gradually becomes apparent, making it difficult for families to recognize their caregiving roles early in the process [24]. In addition, it is estimated that 36% of stroke survivors have post-stroke depression, with mood disturbances being a common symptom [25]. Therefore, assessing post-stroke depression and facilitating information sharing with families is an important aspect of decision-making support.

[Providing opportunities to experience ADL assistance techniques] addresses the fact that stroke often involves complications and recurrence, and many patients have resulting disabilities. Compared to pre-onset levels, their ability to perform ADL often declines, necessitating daily assistance. This factor emphasizes the importance of providing opportunities for families to experience and learn ADL assistance techniques. Since patients need to adjust their daily activities to their home environments after discharge, their caregivers, being required to learn appropriate care techniques, may face increased stress [22]. The provision of opportunities to experience ADL assistance techniques is essential for reducing stress in both patients and caregivers while ensuring patient safety and comfort.

Practicality of the scale. Nursing-led discharge support has been reported to include educational support for home care knowledge acquisition, behavioral change support for stroke recurrence prevention among patients and families, decision-making support, and support for the utilization of the medical welfare system [3]. The results of the present study support this. In

Japan, the estimated number of stroke patients is 1.975 million <Ministry of Health, Labour and Welfare of Japan, <https://www.mhlw.go.jp/toukei/saikin/hw/kanja/20/dl/kanjya.pdf>, (accessed November 6, 2024)>, and although the importance of stroke discharge support is socially recognized, it is not fully implemented. One sign of the poor implementation is the high stroke recurrence rate of 51.3% in Japan [26]. However, with appropriate post-discharge follow-up, stroke recurrence may be prevented, and up to 75% of hospital readmissions for stroke may be preventable [27]. The percentage of stroke patients discharged home in Japan varies by stroke type: 50.1% for cerebral infarction, 90.8% for transient ischemic attack, 27.5% for intracerebral hemorrhage, and 46.1% for subarachnoid hemorrhage <Japan Stroke Data Bank, https://strokedatabank.ncvc.go.jp/f12kQnRl/wp-content/uploads/%E6%97%A5%E6%9C%AC%E8%84%B3%E5%8D%92%E4%B8%AD%E3%83%87%E3%83%CE%E3%82%BF%E3%83%90%E3%83%B3%E3%82%AF%E5%A0%B1%E5%91%8A%E6%9B%B82023%E5%B9%B4_20240129.pdf (accessed January 26, 2025)>. While the home discharge rate has increased due to shorter hospital stays, the stroke recurrence rate remains high. Stroke discharge support is important to prevent potentially avoidable recurrence, and the scale developed in the present study may play a key role in supporting the high home discharge rate and maintaining the quality of life of both patients and their families. The Stroke Discharge Support Evaluation Scale consists of 5 factors that outline specific aspects of stroke patient discharge support. We consider the scale to be usable as an indicator for nurses when they provide discharge support for stroke patients in hospital wards. Furthermore, this scale is expected to provide valuable knowledge for nurses who are newly involved in stroke discharge support, and it can be used as an educational tool in nursing training. The use of this scale may also help reduce hospital readmissions among stroke patients. Finally, it is anticipated that the scale will provide a foundation for the future accumulation of research on discharge support for stroke patients. Going forward, the development of educational programs for stroke patients and the utilization of this scale alongside these programs may enhance its practicality as an instrument to evaluate nursing competency for stroke discharge support.

Research limitations. We asked consenting acute

care hospitals with neurosurgery/neurology wards in the Chugoku and Shikoku regions to distribute the questionnaire to their nurses. However, because responses were voluntary, the present results may reflect responses from individuals with a higher interest in stroke patient discharge support. Additionally, limiting the study to the Chugoku and Shikoku regions may have led to regional differences in the results obtained. The 12 items that exhibited a ceiling effect had high mean values, suggesting that they represent common and essential discharge support tasks performed by nurses for stroke patients. The validation process confirmed that the Stroke Discharge Support Evaluation Scale possesses a certain level of reliability and validity. However, construct validity is an evidence-building process [10], requiring future studies to implement the scale in clinical settings and accumulate further evidence. Moreover, since the model fit indices GFI and AGFI were slightly below the desired values, further studies are needed to examine the reliability of the developed scale through test-retest methods in order to improve its accuracy.

In conclusion, the Stroke Discharge Support Evaluation Scale developed in the present study is a model consisting of 29 items and 5 factors, and statistical analyses demonstrated excellent reliability and validity. The scale may be useful in allowing ward nurses in acute care hospitals to evaluate their own stroke discharge support.

Limitation. This study was conducted within a limited geographical area, which restricts the generalizability of the findings. In particular, although construct validity was examined using the known-groups method, substantial differences were observed among some groups, and the validity of the results cannot be considered fully established. Therefore, future studies should expand the study area and reconsider the selection of target facilities to increase the sample size and improve the construct validity of the developed scale.

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