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Original Article

A study of standard criteria for hospital admission fees using the Nichijo-seikatsu-kino-hyokahyo in Kaifukuki rehabilitation wards

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ABSTRACT

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Purpose: To consider methods, based on study results, which would allow the differences in severity distribution between hospitals to be reflected in the hospital admission fee standards, using the Nichijo-seikatsu-kino-hyokahyo (NSKH).

Methods: A sample of 3,389 patients with stroke was analyzed. Scores obtained from NSKH were divided into four categories: scores 0 to 4, 5 to 9, 10 to 14, and 15 to 19. The numbers of patients in the four categories, changes in NSKH score (NSKH gain), and the return home rates were computed for all the participating hospitals and for each of six and other hospitals. We calculated the adjusted NSKH gain and adjusted return home rate at each hospital, using a correction method based on the distribution of NSKH scores for patients in all the participating hospitals (the standard severity distribution).

Results: The following differences were found between the hospitals. The percentage of patients identified as "critically ill" (with NSKH scores of 10 to 19) ranged from 29.4 to 44.8%. Patients with NSKH scores of 15 to 19 (severely critically ill patients) occupied 33.6 to 50.2% of the patients with NSKH scores of 10 to 19 (critically ill patients). The mean NSKH scores on admission ranged from 6.52 to 8.60, while the adjusted NSKH gain ranged from 2.23 to 3.50 points and the adjusted return home rates ranged from 58.3 to 74.3%.

Conclusion: There may be a need to give higher evaluation to hospitals that show high mean NSKH scores at admission. In addition, adjustment by the standard severity distribution may have to be used in determining NSKH gain and the return home rate.

Key words: Nichijo-seikatsu-kino-hyokahyo, outcome measures, return home rate, gain, severity distribution

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Introduction

The stroke liaison critical pathway (critical pathway for regional collaboration in stroke care) was introduced in 2008 as a measure to strengthen collaboration in the diagnosis and treatment of stroke. The pathway also incorporated revisions regarding remuneration for medical services. The stroke liaison critical pathway has been recognized by the health insurance as a healthcare service. In this context, the daily living functions rating form (known as Nichijo-seikatsu-kino-hyokahyo, or NSKH, in Japanese) [1] has been adopted as an outcome measure in Kaifukuki

rehabilitation wards. The total NSKH scores range from 0 to 19, and patients with a score of 10 or more are considered critically ill.

The following are the requirements for Kaifukuki rehabilitation wards: (1) a return home rate of 60% for hospital admission fee of rank 2, and 70% or higher for hospital admission fee of rank 1; (2) a proportion of critically ill patients of 20% or higher for rank 2, and 30% or higher for rank 1; and (3) during hospitalization, 30% or more of the critically ill patients improve by 3 points or greater for rank 2, and 4 points or greater for rank 1. The purposes of these requirements are to encourage admission of critically ill patients into Kaifukuki rehabilitation wards, to improve their condition, and to ensure that they return home after recovery.

However, patients with higher NSKH scores are less likely to be able to return home. Given that patients with high NSKH gain (NSKH at admission – NSKH at discharge) would need moderate assistance, conditions (2) and (3) can be met by admitting "critically ill patients with a mild level of disability (total NSKH score approaching 10)", while condition (1) can be met by admitting a large number of mildly ill patients with NSKH scores of 9 or lower. As a result, "severely critically ill patients" with NSKH scores of almost 19, who are likely to achieve minimal improvement and have difficulties to be discharged, are at risk of being intentionally avoided.

It is not feasible to conduct a simple comparison of outcome measures such as the return home rate and activities of daily living (ADL) gain between hospitals with different severity distributions (percentage of patients hospitalized with specific levels of severity). Using a discharge to home rate of 70% as one condition and a critically ill patient rate of 30% as an additional condition, the differences in severity distribution between hospitals can be taken into consideration, to some extent. However, the fact that patients with NSKH scores of 10 to 19 are grouped together as one category is a problematic issue. Another issue is the fact that the criteria pertaining to the return home rate and NSKH gain remain unchanged even if the percentage of critically ill patients increases.

In previous studies, the authors designed a method to correct for severity distribution and effectively compared the NSKH gain, Functional Independence Measure (FIM) gain, length of hospital stay, and return home rate among hospitals participating in the Kumamoto Stroke Liaison Critical Pathway [2−5]. The method assumes that patients in each hospital are distributed in the same manner as the standard severity distribution (overall severity distribution in all hospitals), allowing calculation of numerical values adjusted for severity distribution.

The present study was conducted on patients hospitalized in Kaifukuki rehabilitation hospitals registered in the Kumamoto Stroke Liaison Critical Pathway. The objectives of this study were as follows: (1) to divide the NSKH scores at admission to a Kaifukuki hospital into 4 categories (scores 0 to 4, 5 to 9, 10 to 14, and 15 to 19) and to calculate the respective proportions of patients in all participating hospitals and in each of the hospitals, as well as to calculate the mean NSKH gain and mean return home rate; (2) to determine the proportion of critically ill patients (patients with NSKH scores of 10 to 19) in each hospital, and the proportion of severely critically ill patients (patients with NSKH scores of 15 to 19 points) among those identified as critically ill; (3) to adjust each hospital's NSKH gain and return home rate by the standard severity distribution calculated from all participating hospitals; and (4) based on the results, to consider methods that would allow the differences in severity distribution between hospitals to be reflected in the hospital admission fee standards, using the NSKH score.

Subjects and Methods

Between June 6, 2007 and July 22, 2013, a total of 8,249 stroke patients admitted to acute hospitals were registered in the electronic version of the Kumamoto Stroke Liaison Critical Pathway [6]. Among these patients, 3,852 were discharged from Kaifukuki rehabilitation hospitals. Data regarding NSKH scores at the time of admission and discharge, as well as the outcome at the time of discharge from Kaifukuki hospitals was available from 3,389 patients. Thus, 3,389 patients were included in the present study. Participating Kaifukuki rehabilitation hospitals with 200 or more patients were as follows: Hospital A (595 patients), Hospital B (393 patients), Hospital C (392 patients), Hospital D (355 patients), Hospital E (317 patients), and Hospital F (222 patients). In addition, 32 hospitals with 108 or less patients (1,098 patients) and hospitals with unspecified number of patients (17 patients) also participated in the study.

Table 1 shows the basic attributes of the 3,389 patients in this study. Except for the relatively short stay in acute hospitals, the patient attributes at these hospitals were similar to those found in the nationwide survey of patients in Kaifukuki rehabilitation wards [7]. Following discharge from Kaifukuki hospitals, 2,114 patients who lived at home and 124 patients who resided in assisted living facilities were considered "return home". On the other hand, 306 patients who were transferred to long-term care facilities (*roken*), 500 patients to convalescent hospitals, 19 patients to inpatient clinics, 251 patients to acute hospitals, and 75 patients who died were considered "not return home".

Healthcare facilities forming part of the Kumamoto Stroke Liaison Critical Pathway include 9 acute hospitals, 39 Kaifukuki rehabilitation hospitals, 20 long-term care health facilities (*roken*), 39 convalescent

Table 1. Clinical characteristics of subjects in this study compared with national survey.

	This study	Nationwide survey [7]
Age	72.7±13.2 (3,364 cases)	72.0
Sex	Male 1,745,female 1,628,unspecified 16	56.8%males,43.2%females
Infarction, hemorrhage, SAH, unspecified	1,889 cases,891 cases,205 cases,404 cases	—
Duration of onset of stroke to admission	18.1± 9.3 (3,063 cases)	36.6
Length of hospital stay	95.6±56.2 (3,355 cases)	89.4
NSKH at admission	7.6± 5.6 (3,389 cases)	7.4
NSKH at discharge	4.9± 5.8 (3,389 cases)	4.3
NSKH gain	2.7± 3.9 (3,389 cases)	3.2
Return home rate	66.0% (3,389 cases)	67.8%

NSKH, Nichijo-seikatu-kino-hyokahyo; NSKH gain, NSKH at admission-NSKH at discharge; SAH: subarachnoid hemorrhage.
Data for this study are expressed as mean±standard deviation, or number of patients.

hospitals, and 42 clinics. The electronic version of the Kumamoto Stroke Liaison Critical Pathway [6] was created using FileMaker Pro (in facilities with no FileMaker Pro, the runtime version was used). The data that were captured and recorded during the acute, recovery, and maintenance periods were collected three times a year by the Department of Neurology at Kumamoto Red Cross Hospital. Each hospital sent the data after removing all personal information such as name, address, and date of birth. The patient data obtained during the acute, recovery, and maintenance phases were linked using the name of the hospital during acute phase, the identification number (ID), and the date of admission as keys. An alert function was used to indicate any entry omission relating to these three indicators. Upon obtaining permission from the representative of the Kumamoto Stroke Liaison Critical Pathway, data containing no personal information collected from all participating hospitals in the region were analyzed. In 2007, the Kumamoto Stroke Liaison Critical Pathway initiated manual registration of patients on paper. In 2009, both paper and electronic modes were used. In 2011, there were requests for registration of all patients in acute hospitals. In 2013, a broad transition to electronic patient registration was undertaken. As of July 2013, the electronic version of the Kumamoto Stroke Liaison Critical Pathway had 8,254 registered cases, and currently serves as a database of stroke patients in Kumamoto [8, 9].

This epidemiological research had a retrospective design. In September 2013, permission to conduct the study was obtained from K-STREAM representatives. Anonymous data from all patients in the Kumamoto Stroke Liaison Critical Pathway was subsequently saved in an Excel format. In accordance with the provisions of the clinical research review board of Kumamoto Kinoh Hospital, permission was obtained from the official who had been nominated in advance by the review board. The study was subsequently conducted. All personal information was converted into data and treated in a way that prevented the identification of individuals.

Study 1: Proportions of patients in four categories based on NSKH scores, NSKH gain, and return home rate

The NSKH scores at the time of admission to Kaifukuki hospitals were divided into 4 categories: scores 0 to 4 5 to 9, 10 to 14, and 15 to 19. We calculated the proportions of patients in the four categories, mean return home rate, and mean NSKH gain for all the participating hospitals as well as for each of the hospitals (Hospitals A to F and other hospitals). Next, we calculated the proportion of critically ill patients with NSKH scores of 10 to 19 and the proportion of severely critically ill patients with NSKH scores of 15 to 19 among those identified as critically ill. However, the standard severity distribution was determined based on the proportions of patients in the four categories in all of the participating hospitals. ADL gain was calculated as {(ADL at the time of discharge) – (ADL at the time of admission)}. However, if NSKH gain was calculated as {(NSKH at the time of discharge) – (NSKH at the time of admission)}, then the gain would be a negative numerical value. It was resolved that NSKH gain would be calculated as {(NSKH at the time of admission) – (NSKH at the time of discharge)}.

Study 2: Adjusted NSKH gain and adjusted return home rate

The return home rate and NSKH gain at each hospital were adjusted using the standard severity distribution. The method of adjustment was similar to that used in previous reports [2–5]. Specifically,

adjusted NSKH gain was calculated by multiplying the standard severity distribution by the mean increase in NSKH score in relation to the four categories at each of the hospitals. Likewise, the adjusted return home rate was calculated by multiplying the standard severity distribution by the return home rate in relation to the four categories at each hospital. As previously reported, implementing adjustment based on the standard severity distribution results in a considerably lower adjusted NSKH gain, particularly in hospitals where considerable improvement in NSKH is attributed to a large number of patients receiving moderate assistance, and hence substantial NSKH gain [2]. This means that the adjusted return home rate is generally low in hospitals with a high return home rate and a large number of mildly ill patients [3]. Adjustment based on the standard severity distribution results in patients being stratified into six (2 multiplied by 3) groups comprising two groups based on age, and three based on the FIM at the time of admission. In a study that implemented adjustment according to the standard severity distribution, a 26.0-point difference in FIM at admission between three hospitals was decreased to only 2.1 points after adjustment [4].

Results

For all the participating hospitals, the proportions of patients with NSKH scores of 0 to 4, 5 to 9, 10 to 14, and 15 to 19 were 0.371, 0.244, 0.217, and 0.168, respectively (standard severity distribution) (Table 2a).

The proportions of critically ill patients with NSKH scores of 10 to 19 ranged from 29.4% (Hospital C) to 44.8% (Hospital D). This proportion was 38.5% for all the participating hospitals (Table 2a). Among critically ill patients, the proportions of severely critically ill patients with NSKH scores of 15 to 19 ranged from 33.6% (Hospital A) to 50.2% (other hospitals). This proportion was 43.6% for all the participating hospitals (Table 2a). The ranking of hospitals according to the proportion of critically ill patients (Hospital D > other > E > B > F > A > C) and that according to the proportion of severely critically ill patients (other > E > D > C > B > F > A) did not match (Table 2a).

The average NSKH scores at the time of admission ranged from 6.52 points (Hospital C) to 8.60 points (Hospital D) (Figure 1). For Hospital D where the proportion of critically ill patients and the mean NSKH score at admission were the highest, the return home rate was as low as 60.7%. However, when the standard severity distribution was used for correction, the adjusted return home rate increased to 65.7% (Figure 1). Meanwhile, for Hospital C where the proportion of critically ill patients and the average NSKH score at admission were the lowest, the return home rate decreased from 64.5% to 58.3% after adjustment. The ranking of the hospitals in terms of mean NSKH score at the time of admission (Hospital D > others > E > F > B > A > C) was almost identical to the ranking in terms of the proportion of critically ill patients (Hospital D > others > E > F > B > A > C) (Figure 1, Table 2a).

The adjusted NSKH gain ranged from 2.23 points (Hospital A) to 3.50 points (Hospital B) (Table 2b), while the adjusted return home rates ranged from 58.3% (Hospital C) to 74.3% (Hospital F) (Table 2c).

Discussion

Based on the results of Studies 1 and 2, the authors propose the following as standard criteria for hospital admission fees based on NSKH. (1) Ideally, hospitals admitting a large number of critically ill patients (hospitals with high mean NSKH score at admission) should be evaluated favorably. (2) Ideally, an adjusted return home rate (return home rate corrected according to the standard severity distribution) should be used as the standard for the return home rate. (3) Adjusted NSKH gain is being used for evaluating NSKH gain. However, since the accuracy of NSKH scoring across Japan is not yet guaranteed, ideally adjusted NSKH gain should only be used as a minor standard.

With regard to the revision of the standards for hospital admission fees using NSKH, two concerns have emerged; namely, "whether NSKH is an appropriate tool for the evaluation of severity," and "whether there are problematic issues with the current standards for hospital admission fees using NSKH."

Various concerns have emerged regarding"whether NSKH is an appropriate tool for the evaluation of severity."In 2009, Sonoda et al. [11] pointed out that "future studies would need to examine what NSKH stands for as an indicator, and whether it represents rehabilitation outcomes." Nonetheless, these issues have not been addressed to date, despite the fact that NSKH was introduced more than five years ago, in 2008, as a method of evaluating severity in Kaifukuki rehabilitation wards. Furthermore, attempt to correct the NSKH would be difficult.

Regarding "whether there are problematic issues with the current standard criteria for hospital admission fees based on NSKH", some issues are as follows. (1) If critically ill patients with NSKH scores of 15 to 19 are admitted, the standard criteria pertaining to the degree of improvement in these patients would not be easily met. As a result, less critically ill patients with NSKH scores of 10 to 14 would be selected. (2) If the proportion of critically ill patients admitted exceeds the standard 30%, then the criteria pertaining to the return home rate are unlikely to be met. This could result in an undesirable down-adjustment of admission of critically ill patients to approximately 30%, in accordance with the standard criteria. In this study, the overall proportion of critically ill patients was 38.5% in all hospitals, but the proportion varied among

Table 2. Four categories based on NSKH scores.

(a) Proportion of patients

	NSKH score 0–4	scores 5–9	scores 10–14	scores 15–19	scores 10–19	Total	scores 15–19 / scores 10–19
All hospitals: 3,389 patients (standard severity distribution)	0.371	0.244	0.217	0.168	0.385	1	0.436
Hospital A: 595patients	0.398	0.281	0.213	0.108	0.321 (6)	1	0.336 (7)
Hospital B: 393 patients	0.412	0.209	0.244	0.135	0.379 (4)	1	0.356 (5)
Hospital C: 392 patients	0.449	0.258	0.179	0.115	0.294 (7)	1	0.391 (4)
Hospital D: 355 patients	0.301	0.251	0.234	0.214	0.448 (1)	1	0.478 (3)
Hospital E: 317 patients	0.375	0.224	0.205	0.196	0.401 (3)	1	0.489 (2)
Hospital F: 222 patients	0.356	0.275	0.239	0.131	0.370 (5)	1	0.354 (6)
Other hospitals: 1,115 patients	0.338	0.230	0.215	0.217	0.432 (2)	1	0.502 (1)

(b) Average NSKH gain

	NSKH scores 0–4	scores 5–9	scores 10–14	scores 15–19	Average	Adjusted average
All hospitals	0.89	3.65	4.37	3.25	2.71	—
Hospital A	0.84	3.23	3.02	2.83	2.19 (7)	2.23 (7)
Hospital B	1.12	4.76	4.95	5.08	3.35 (1)	3.50 (1)
Hospital C	1.06	3.69	4.54	3.42	2.63 (6)	2.86 (3)
Hospital D	0.81	3.37	4.40	2.91	2.74 (4)	2.57 (6)
Hospital E	0.67	4.06	4.86	3.05	2.75 (3)	2.81 (4)
Hospital F	1.03	3.64	4.42	4.66	3.03 (2)	3.01 (2)
Other hospitals	0.79	3.55	4.64	2.93	2.72 (5)	2.66 (5)

(c) Return home rate

	NSKH scores 0–4	scores 5–9	scores 10–14	scores 15–19	Average	Adjusted average
All hospitals	93.1	76.3	44.7	19.1	66.0	—
Hospital A	92.0	77.8	43.3	15.6	69.4 (3)	65.1 (5)
Hospital B	95.7	72.0	51.0	26.4	70.5 (2)	68.6 (2)
Hospital C	88.1	72.3	30.0	8.9	64.5 (4)	58.3 (7)
Hospital D	95.3	78.7	41.0	13.2	60.7 (7)	65.7 (4)
Hospital E	93.3	69.0	52.3	12.9	63.7 (5)	64.9 (6)
Hospital F	96.2	90.2	47.2	37.9	75.2 (1)	74.3 (1)
Other hospitals	93.6	76.2	45.8	21.5	63.7 (5)	66.9 (3)

Four categories based on NSKH scores, the NSKH scores at admission were divided into 4 categories (scores 0–4, 5–9, 10–14, 15–19).

Standard severity distribution, numbers of patients in 4 categories were divided by number of all patients (for example: 0.371=1,257patients/3,389 patients).

Adjusted average, calculated by multiplying the standard severity distribution by the average for the hospital (for example: 0.84*0.371+3.23*0.244+3.02*0.217+2.83*0.168=2.23).

Numbers in parenthesis, ranking of the hospitals; scores 15–19/scores 10–19, proportion of patients with NSKH scores of 15 to 19 among patients with NSKH scores of 10 to 19.

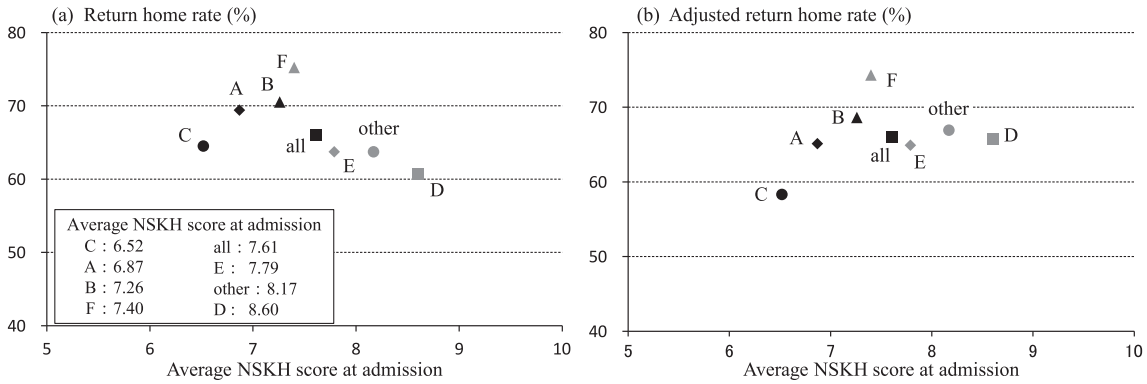

Figure 1. Relation of average NSKH score at admission with return home rate (a) and adjusted return home rate (b).
all, all hospitals; A to F, Hospital A to F; other, other hospitals.

hospitals, ranging from 29.4 to 44.8%. In addition, the overall proportion of less critically ill patients with NSKH scores ranging from 15 to 19 was 43.6% in all hospitals; however, the proportions ranged from 33.6 to 50.2% among hospitals. Based on these results, we cannot be certain whether the above-mentioned negative effects actually occur, although we cannot rule out the possibility that some hospitals may intentionally avoid admitting severely critically ill patients with NSKH scores ranging from 15 to 19.

In order to favorably evaluate hospitals that admit a large number of severely critically ill patients, the first conceivable proposal is that the current classification of patients into two categories according to NSKH scores of 0 to 9 and 10 to 19 should be modified to four categories. The four categories would be NSKH scores of 0 to 4, 5 to 9, 10 to 14, and 15 to 19. Furthermore, patients with NSKH scores of 5 to 9 should be assigned an equivalent degree of severity of 0.2 points, those with NSKH scores of 10 to 14 an equivalent degree of severity of 0.8 points, while those with NSKH scores of 15 to 19 an equivalent degree of severity of 1.2 points. In addition, hospitals that achieve a value that is compatible with the mean equivalent degree of severity should be highly evaluated. The second proposal is in relation to the calculation of the mean NSKH at admission in each hospital, suggesting division of the total NSKH score of each patient by the number of hospitalized patients, as was done in this study. In this regard, hospitals with a high mean NSKH at admission would be highly evaluated. If the objective is to further promote hospitalization of severely critically ill patients, another conceivable method would be to calculate the mean NSKH score at admission focusing on only 40% of the patients, starting from those with the highest NSKH score and continuing in descending order. The major concern with the first proposal is the validity of the equivalent degree of severity score (0 points, 0.2 points, 0.8 points, and 1.2 points). The problem with the second proposal relates to the type of coefficient that should be multiplied by NSKH at admission, in order to show its importance.

To prevent low return home rate and low NSKH gain due to inadequate rehabilitation services even though a facility admits a large number of critically ill patients, standard criteria for the return home rate and NSKH gain may also be necessary. In such case, hospitals with a larger number of critically ill patients would have to lower the standard criteria for return home rate. First, a conceivable method is to set the range of return home rate from 60% to 70% when the proportion of critically ill patients is 30%, and 40 to 50% when the proportion of critically ill patients is 50%. However, this does not solve the current problem, which relates to the definition of critically ill patients as those with NSKH scores of 10 to 19 (patients with NSKH scores of 10 to 14 points are less critically ill). Another method involves the establishment of a separate standard for the return home rate among severely critically ill patients or, alternatively, the use of simple linear regression analysis to determine standard criteria for the return home rate, depending on the mean NSKH score at admission. However, if the return home rate is corrected by the standard severity distribution, only one standard (adjusted return home rate) would be sufficient.

In addition, to increase the admission rate of severely critically ill patients in Kaifukuki rehabilitation wards, admission to a highly sophisticated long-term care health facility (*roken*) also can be regarded as a home environment to which patients can return. Even if the potential to return home cannot be predicted based on the period of hospitalization at a Kaifukuki rehabilitation ward only, the potential can be predicted in some patients if the duration of admission to a high-performance long-term care health facility is taken into consideration. Furthermore, if admission to a high-performance long-term care health facility is considered as equivalent to returning home, it would facilitate the admission of severely critically ill patients to Kaifukuki

rehabilitation wards.

Although there is a need for the development of standard criteria for NSKH gain, accurate prediction of such gain among stroke patients is difficult to achieve [12]. To summarize research papers using multiple regression analysis for such a prediction, reports have stated that the determination coefficient with a corrected degree of freedom (R^2) ranges from an estimated 0.46 to 0.73 [13]. Although group tendencies can be predicted, this is not applicable to predictions in individual patients [13]. However, the prediction of mean NSKH gain and ADL gain in a hospital setting, referred to as "prediction of tendencies as a group," might be possible. In order to compare hospitals in terms of NSKH and ADL gain, differences between hospitals, particularly with regard to severity distribution, must be taken into consideration. Such a difference is not easy to correct. In fact, although a number of reports [2, 4, 5, 14−16] have compared NSKH score and ADL gains at Kaifukuki rehabilitation hospitals participating in stroke liaison critical pathways, with the exception of a report by the current authors, all the other studies [2, 4, 5, 14] were simple comparisons of hospitals according to ADL gain [15,16]. In the present study, the difference in severity distribution between hospitals was corrected using the standard severity distribution. However, NSKH gain showed no change, suggesting that accurate prediction of NSKH gain is more difficult than numerical parameters such as the return home rate. In addition, "accurate scoring of NSKH" has been entrusted to each hospital. Therefore, there is no guarantee regarding the accuracy of NSKH gain [10]. Although the accuracy of NSKH scoring in each hospital should be empirically verifiable, evaluation of accuracy in this regard is still at an experimental stage [17−19]. For this reason, the standard criteria for NSKH gain among critically ill patients cannot be established precisely as the standard criteria for the proportion of critically ill patients and the return home rate. Thus, NSKH gain should probably be used as a minor standard.

In order to ensure that the NSKH score functions optimally as a performance indicator in Kaifukuki rehabilitation wards, and that severely critically ill patients are not excluded from Kaifukuki rehabilitation wards, research examining the standard criteria for hospital admission fees based on NSKH scores, such as the present study, is necessary. In addition, the development of techniques that allow accurate evaluation of rehabilitation outcomes is desirable.

The present research project had several limitations.

First, the accuracy of NSKH scoring is inconclusive. To this effect, uncertainties have been expressed regarding the accuracy of current methods used to score NSKH [10, 17−20].

Second, whether patients who had returned home were subsequently re-hospitalized remains unclear. The condition for returning home from a long-term care health facility (*roken*) is that the patient should stay home for at least a month. However, this is no condition for returning home after admission to Kaifukuki rehabilitation wards. In this regard, the numerical value of the return home rate should be accurately determined, excluding patients who are readmitted to a Kaifukuki hospital several days later.

Third, the findings observed in Kumamoto are not necessarily generalizable to the entire country (Japan). We observed the following in Kumamoto: (1) the transfer of stroke patients from acute hospitals to Kaifukuki rehabilitation hospitals takes 18.3 ± 9.3 days on average (median: 16 days) [21], which is approximately half the national average of 36.6 days [7]; (2) there is a plan to provide "equal accessibility" of stroke treatment and rehabilitation [22]; (3) a nationwide survey of Kaifukuki rehabilitation wards showed that the number of patients with a NSKH score of 10 at the time of discharge from acute hospitals was two to three times higher than those with a NSKH score of 9 [7, 20], which is different from the findings in Kumamoto where the number of patients with a NSKH score of 10 was equal to that of patients with a score of 9 [17]. In addition, since no nationwide survey has been conducted, comparisons with other prefectures showed the following: (1) unlike Hyogo [23] and Kagawa [24] prefectures, "the average stay in Kaifukuki hospitals" and "the average stay in acute hospitals and Kaifukuki hospitals" became significantly shorter following the introduction of the liaison critical pathway in Kumamoto [25]; (2) unlike Hyogo Prefecture where FIM gain in Kaifukuki rehabilitation hospitals has reportedly decreased following the introduction of the stroke liaison critical pathway [23], the FIM gain increased from 19.3 points to 21.2 points in Kumamoto, although this increase was not significant [25]. In a nationwide survey conducted by the Kaifukuki Rehabilitation Ward Association, the proportions of patients with NSKH scores of 0 to 4, 5 to 9, 10 to 14, and 15 to 19 were 0.391, 0.293, 0.250, and 0.065, respectively [7]. However, the data obtained from that study was not limited to stroke patients only. If the standard severity distribution among stroke patients nationwide is known, then adjusted NSKH gain and return home rate can be calculated in all hospitals across Japan.

Fourth, NSKH gain cannot be said to reflect a hospital's rehabilitation performance. In relation to this, Sonoda et al. [11] indicated that "while some aspects of the NSKH score allow for evaluation of the ADL, it is difficult to say whether it is compatible with the FIM, and therefore, studies need to be conducted to examine whether NSKH scores are indicative of the rehabilitation outcome." A survey conducted by Tokunaga et al. [14] also showed that in Kumamoto, while FIM gain and the Barthel index (BI) gain were higher than the national average, NSKH gain was

lower than the national average. Among four hospitals that were studied, NSKH gain was low at the hospital where FIM and BI gain were the highest [14]. In addition, low NSKH gain that indicates inadequate perception of symptom improvement in Kaifukuki rehabilitation wards may have negative implications on NSKH score. According to a study by Tokunaga et al. [26], when the mean NSKH gain was 2.1 points, the mean gain in corrected FIM subjected to the same 20-level evaluation as NSKH was 4.3 points, while the mean FIM gain was 23.8 points. In this regard, a study showed that during hospitalization at Kaifukuki rehabilitation wards for an average of 84 days, FIM improved by 1 point in approximately 3.5 days, corrected FIM improved by 1 point in 19.5 days, whereas it took as long as 40 days for NSKH to improve by 1 point [26].

Fifth, age was not taken into consideration. Similar to NSKH score at admission, age also affects the return home rate as well as NSKH gain [27, 28]. However, adjustment for both age and ADL at admission would be complicated.

Sixth, the patients' living environment prior to the development of stroke was not investigated. Therefore, the numerical value of the return home rate should not be the sole focus. For instance, patients who had previously been admitted to Kaifukuki hospitals before developing stroke would have difficulties returning home. In addition, the likelihood of returning home is greatly affected by the capabilities of the patient's family to provide nursing care. In recent years, the increase in number of elderly people living alone or providing nursing care for another elderly has made it increasingly difficult for patients to return home after treatment. Based on the hospital admission fee criteria according to NSKH score, returning home from Kaifukuki rehabilitation wards has been introduced. However, unless there is a policy that supports the patients and their families to facilitate the patient to return home, hospitals may ultimately have to force the patients and their families to take the patients home.

Seventh, for correction of patient severity employing the standard severity distribution, the findings in hospitals with a small number of patients would be inaccurate, and it would not be feasible to test the adjusted numerical values for significant differences [2].

Eighth, patients admitted to Kaifukuki rehabilitation wards are not exclusively stroke patients, but also include those with orthopedic diseases and disuse syndromes. The return home rate is 67.8% for stroke patients and 78.8% for orthopedic patients [7]. The two conditions also have different clinical features [29]. Changing the ratio of patients with stroke to those with orthopedic diseases would change the NSKH gain and the return home rate in a given ward. Therefore, the proportions of patients with stroke, orthopedic problems, and disuse syndrome would also need to be taken into consideration when interpreting the NSKH gain and return home rate.

Lastly, the standard criteria for admission fees should not be too complicated. It might be difficult to create new hospital admission fee criteria that are concise and with minimal adverse effect. We hope such hospital admission fee criteria would make Kaifukuki rehabilitation wards better.

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