図１　東京都内リハビリテーション診療施設

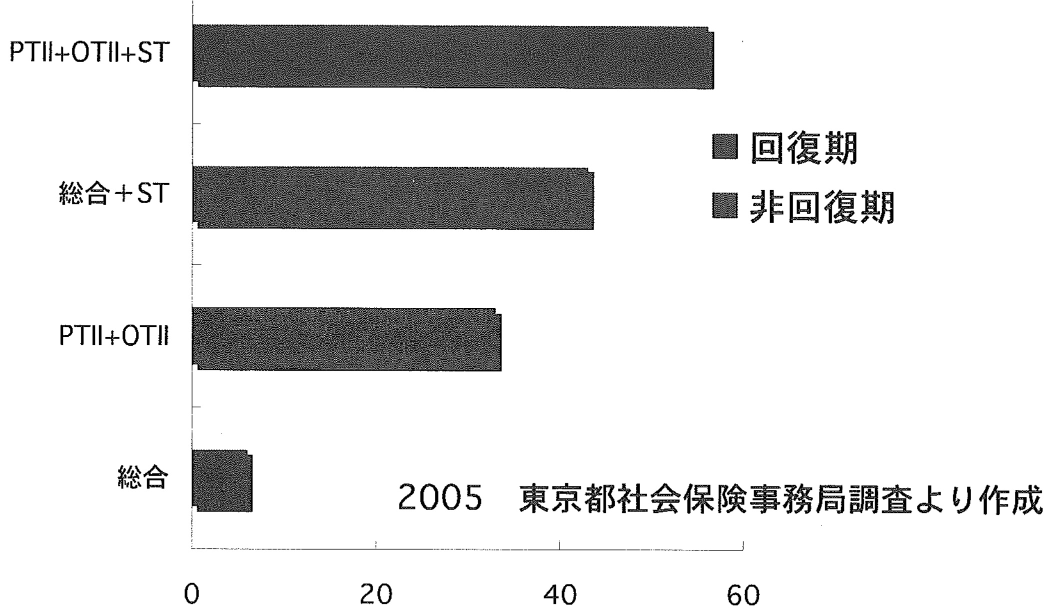

図２　人口10万対地方別回復期リハ病床数

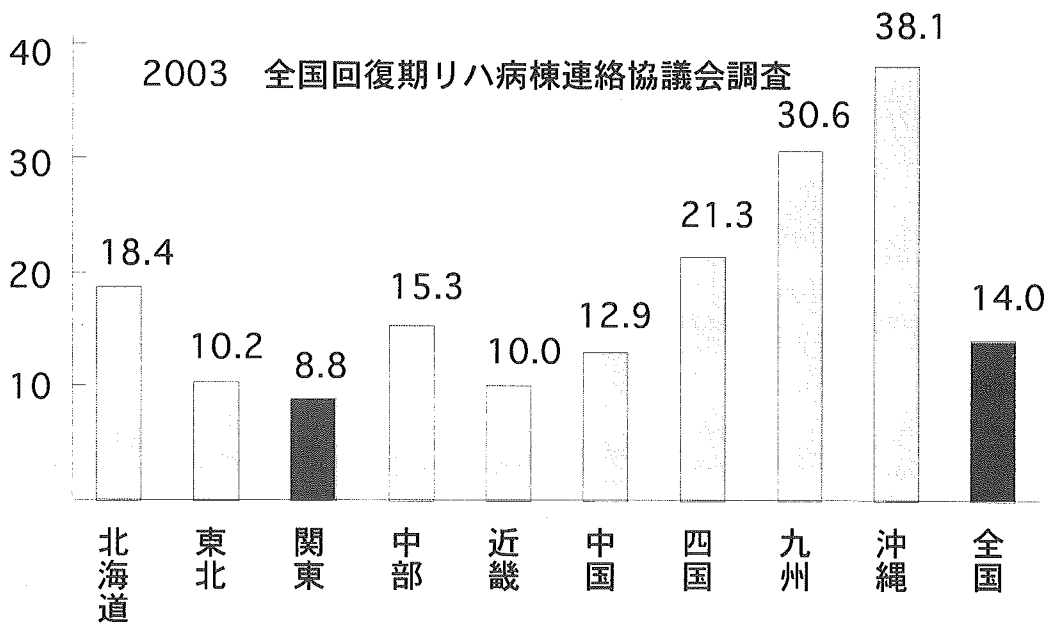

表3　回復期リハ病棟の実態

	連絡協議会	リハ医学会
施設数	99施設 （全て回復期）	297施設 （回復期79）
総合	72.9%	78.5%
理学II＋作業II	27.1%	21.5%
入院までの期間	44.5日	48.1日
平均在院日数	84.8日	74.4日
在宅復帰率	64.30%	−

※文献2より引用

図 3　大都市圏脳卒中診療連携体制の構築

ニーズと資源のマッチング用データベースを用いたリハ医療連携システムの開発と効果の実証

研究の背景

◆健康フロンティア戦略：診療連携の重要性
◆地域完結型脳卒中診療体制の試み
◆大都市圏特有の問題→実効性のある連携体制なし
（広域性、急性期資源＞回復期・維持期資源）

研究の目的

◆大都市圏における診療連携阻害要因の実証的分析
◆ITを活用した脳卒中診療連携ネットワークの構築
→急性期から維持期に至る切れ目のないリハの提供
→生活機能、在宅復帰率の向上

研究推進体制

◆大学病院（4）を含む急性期病院
◆都指定の地域リハ支援センター全9施設
◆都内の回復期、維持期のリハ施設
◆近隣県（埼玉、千葉）の広域支援センター
◆行政、疫学・システム設計・法律専門家

ホスティングサーバー／ドメイン取得　　広域LANの構築

「Webアンケート調査」
診療スタッフ向け
患者・家族向け
一般市民向け

「リハナビ東京」
リハ資源データベース
（登録型サーチエンジン）

「脳卒中診療動向調査」
参加施設診療実態調査
→データベース化

「連携マッチングシステム」
（患者流通システム）

研究参加施設
・急性期／回復期／維持期診療施設
・介護保険事業所
・自治体

「仮の要介護状態」への対応（本研究事業）
「仮の要介護状態」の予防（今後の研究課題）

III. 研究成果の刊行に関する一覧表

III. 研究成果の刊行に関する一覧表

著者名	論文タイトル名	書籍全体の編集者名	書籍名	出版社名	出版地	出版年
山田 深、岡島康友	高齢者のリハビリテーション「障害の評価」	越智隆弘	整形外科学大系25巻 高齢者の運動器疾患	中山書店	東京	in press
里宇明元	介護保険制度の展望ー先進リハビリテーション医学の介入. リハビリテーション医学の立場からー「仮の要介護状態への対応」	高度先進リハビリテーション医学研究会	第13回高度先進リハビリテーション医学研究会講演集	高度先進リハビリテーション医学研究会	東京	2006（印刷中）

発表者氏名	論文タイトル	発表雑誌	巻号	ページ	出版年
山田 深、里宇明元	仮の要介護状態とその対策	リハ医学	42(10)	690-696	2005
Yamada S、Liu M, Hase K,Tanaka N, Fujiwara T, Tsuji T, Ushiba J	Development of a short version of the motor FIM for use in long-term care settings.	J Rehabil Med	37(1)	1-8	2006
山田 深、大田哲生、里宇明元、木村彰男、長谷公隆、田中尚文、藤原俊之	FIMオンライン採点支援プログラム「iFIM」の開発	総合リハ	34(1)	69-76	2005
山田 深	廃用症候群の地域リハビリテーション	クリニカルプラクティス	25(5)	in press	2006
Yamada S, Liu M, Hase K, Tanaka N, Fujiwara T, Tsuji T, Fujimoto M, Otsuka T, Miyashita Y.	Reconditioning hospitalization for patients with stroke in the chronic phase: factors related to functional deterioration and effectiveness of interventions.	The Keio Journal of Medicine	（投稿予定）		
Yamada S, Liu M, Izumi S, Hase K, Fujiwara T, Tsuji T, Fujimoto M, Numata M, Lau Y, Ohta K, Fujiwara Y.	Development of a screening instrument for the ⅹquasi-in-need-of-care stateŧ in the community.	Disabil Rehabil	（投稿予定）		
Liu M, Yamada S, Izumi S, Hase K, Fujiwara T, Tsuji T, Fujimoto M.	Toward the independence of elderly persons with disability in the community _ a model system for screening and intervention for the "quasi-in-need-of-care state".	J Rehabil Med	（投稿予定）		

Ⅳ. 研究成果の刊行物・別刷

J Rehabil Med 2005

Taylor & Francis
Taylor & Francis Group

DEVELOPMENT OF A SHORT VERSION OF THE MOTOR FIM^{TM} FOR USE IN LONG-TERM CARE SETTINGS

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Objective: **To develop a short version of the motor Functional Independence Measure (FIM^{TM}) for use in long-term care settings.**

Participants: **For model construction, the participants were 398 community-dwelling persons with disability (mean age 79.3 years (SD 10.3)) who were receiving visiting nurse services. For cross-validation, 169 patients with stroke (mean age 78.0 years (SD 11.2)) in the chronic phase and 187 patients with stroke (mean age 63.4 years (SD 12.7)) in the recovery phase.**

Design: **Model construction and cross-validation study.**

Main outcome measures: **The second power of correlation coefficient (R^2) was used for agreement analysis between the short and the full version. Cross-validation of the models was estimated with the intraclass correlation coefficient (ICC).**

Results: **Five to 7 motor FIM^{TM} items were selected for the models based on Rasch calibration and consideration of internal consistency. Total motor FIM^{TM} was estimated with the 6-item and 7-item models with regression analysis, which yielded high correlations with the original 13-item motor FIM^{TM} score ($R^2 > 0.95$). Regression formulas derived from the models could estimate total motor FIM^{TM} scores accurately in the 2 cross-validation samples (ICC $>$ 0.98).**

Conclusion: **The short version of the motor FIM^{TM} developed is a useful measure of functional status, not only in long-term care but in the recovery phase rehabilitation settings.**

Key words: instrument, activities of daily living, stroke, Rasch analysis, community-based rehabilitation.

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INTRODUCTION

With ageing societies, the number of persons who are in need of care is increasing. In Japan, together with health insurance plans that cover acute and recovery phase rehabilitation services, a nation-wide public insurance program called the Public Long Term Care Insurance Program was started in 2000 to cover care and rehabilitation needs after completion of active medical treatment (1). To ensure consistency and continuity of care, it is important for health professionals involved at various phases to have a common language to describe functioning of the patients.

In medical rehabilitation, the Functional Independence Measure (FIM^{TM}) is widely used to document patients' functional status and its changes (2). The FIM^{TM} includes 13 motor and 5 cognitive items, and the scoring ranges from 1 (complete dependence) to 7 (complete independence). Originally developed as a unified instrument to evaluate disabilities as a part of a large rehabilitation database called the Uniform Data System for Medical Rehabilitation (UDSMR) (3), it has been shown to be a reliable, valid, practical and responsive instrument to describe functional status at admission, discharge and follow-up for various disabilities (4–7).

Despite its established usefulness in inpatient rehabilitation settings, the FIM^{TM} has the following limitations when used in long-term care settings: (i) it may not be adequate for assessing outpatient rehabilitation outcomes due to the higher levels of functioning and additional areas and domains of importance seen in the outpatient settings (8); (ii) although post-discharge follow-up FIM^{TM} scores are typically obtained by telephone or in-person interview (9), the reliability and validity of the FIM^{TM} in subacute and home health settings have not been well established (6), especially for the cognitive subscale (10); (iii) it is often difficult to carry out full assessment with the FIM^{TM} at home where time is limited for the raters, because it takes approximately 20–30 minutes to complete even for trained assessors (11, 12); (iv) it is often necessary to obtain information from family members to get a complete picture of a person's activities of daily living, and it can be time-consuming to interview carers, especially when they are themselves aged; (v) it is costly and time-consuming to train visiting nurses and carers who are not familiar with the FIM^{TM} reliably to assess the full version of the FIM^{TM}.

Thus it has not been practical to use the FIM^{TM} in long-term care. In the USA, the Minimum Data Set (MDS) (13) has been used widely in nursing homes, and an attempt has been made to bridge the gap between acute rehabilitation and long-term care by developing a pseudo-FIM by selecting and re-scaling 12 items from the MDS that corresponded to the FIM^{TM} items (14). However, the MDS is not widely used in Japan, and no studies are available examining reliability and validity of the pseudo-FIM among the Japanese population. Although 2 studies are reported describing short versions of the FIM^{TM}, 1 for acute

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trauma care (15) and the other for spinal cord injury (16), no attempt has yet been made to develop one for use in long-term care settings.

Because disability assessment is indispensable for planning care services, predicting outcomes and tracking changes in functional status, there is a strong need for a standardized common scale that can be used practically in long-term care in continuity with acute and recovery phase rehabilitation. The purpose of this study is therefore to develop and cross-validate a minimum set of the FIM™ motor items that can reliably and accurately estimate total motor FIM™ scores in long-term care settings.

METHODS

Although the FIM™ consists of 13 motor and 5 cognitive items, we used only the 13 motor items because: (i) it is known with Rasch analysis (17) that the FIM™ conforms to a unidimensional model if the motor and cognitive subscales are analysed separately (6); (ii) somewhat lower test-retest reliability is reported for the cognitive items than for the motor items in aged persons living in the community (10); (iii) a higher degree of experience is necessary reliably to assess cognitive function with the FIM™ (9, 10). Thus we excluded cognitive items to simplify model construction. We did not consider reducing the number of categories for scaling, because this would make the instrument less responsive to changes. We intended to make the assessment less laborious and more practical to administer in long-term care settings by reducing the number of items.

This study involved the following 3 steps: (i) construction of 3 models consisting of 5–7 motor FIM™ items by analysing the structure of functional status of community-dwelling people with disability and selecting proper items from the 13 motor FIM™ items; (ii) analysis of the performance of the above model subsets to predict the original 13-item motor FIM™; (iii) cross-validation of the models by applying them to different samples.

Participants

For model building, we originally recruited 1710 community-dwelling elderly persons who were receiving visiting nurse services covered by the Public Long-term Care Insurance Program from 32 visiting nurse service stations (11 in Tokyo, 3 in Sendai and the remaining 18 stations in Hokkaido, Kanto, Tokai and Kansai areas) belonging to a same provider group (SECOM Co. Ltd). This was because the services provided were more standardized across the stations and it was easier to assure uniformity of assessment through periodic training sessions. A total of 127 visiting nurses belonging to these stations, who had been well trained in the FIM™ assessment in advance, collected FIM™ data about their clients from December 2003 to January 2004. The Japanese version of the FIM™ has culturally relevant modifications for some of the items. The principal modification is in eating. Use of a spoon instead of chopsticks does not lower the score (18). Before data collection, the purpose and procedures were explained to the clients and their family carers, and written informed consent was obtained. After excluding patients who refused to participate in the study (1174) and patients receiving terminal care (80), 456 patients were enrolled (group M). Among them, 58 patients were excluded because of incomplete data, and the final sample comprised 398 patients (168 men and 230 women) with a mean age of 79.3 (SD 10.3) years and mean length of service period of 514.5 (SD 404.5) days (median 440 days). Among them, 256 patients suffered from stroke, 132 from diseases of internal organs, such as chronic heart failure or diabetes, and 93 from bone and joint diseases (duplicates permitted).

For cross-validation of the model developed, we used data from 2 samples of patients with stroke. One was a group of patients in long-term care settings (group L). Trained rehabilitation professionals assessed the FIM™ cross-sectionally in 169 patients recruited from 6 participating institutions including 1 long-term care hospital ward, 1 general ward, 2 visiting rehabilitation service facilities and 2 health service facilities for the elderly (68 men, mean age 78.0 (SD 11.2) years, mean duration of stroke 1337.2 (SD 1491.9) days (median 843 days)). There were 122 with cerebral infarction, 37 with cerebral haemorrhage and 10 with subarachnoid haemorrhage. Fifty-six patients had right brain damage, 61 had left brain damage and 52 had bilateral or multiple lesions. The second sample consisted of patients with stroke hospitalized for recovery phase rehabilitation. The admission (group A) and discharge (group D) FIM™ data of 187 consecutive patients (98 males) admitted to Tsukigase Rehabilitation Center, one of the affiliated hospitals of Keio University, from May 1998 to August 2001 were available as a part of a structured rehabilitation database, and these data were used for analysis. The mean age of the patients was 63.4 (SD 12.7) years, the mean time from onset to admission was 44.1 ± (SD 23.4) days (median 42 days), and mean length of stay was 99.1 (SD 52.6) days (median 95 days). One hundred suffered from cerebral infarction, 75 from cerebral haemorrhage and 12 from subarachnoid haemorrhage. Eighty-two patients had right brain damage, 88 had left, 5 had brainstem and 12 had bilateral or multiple lesions.

Model building

To reduce the number of motor FIM™ items, we selected 5–7 items based on a statistical approach and clinical judgement. Because it is important for a good instrument to have its item difficulty spread at equal intervals, we performed Rasch analysis using the data obtained from the model-constructing sample to evaluate item difficulty levels. As a result of this calibration, we thinned out items shown to have closer difficulty levels. Rasch analysis is a specific item-response theory technique to investigate the difficulty level of items included in a scale (19). An output parameter of Rasch calibration called "logit", which is allocated to scale items and individual subjects, means the relative difficulty level among them. Ideally, the separation gap between each item is 0.15 logits or more (20). Including both extremes of the difficulty levels, we selected 5 items whose logit values were close to the ideally separated points so as to ensure maximum distribution. For items exhibiting similar difficulty levels, we selected items for the model based on our clinical judgement of their importance in rehabilitation practice.

Next, we added 1 or 2 items to the 5-item subset to reinforce internal consistency based on consideration of the 4 subcategories of the motor FIM™ items (i.e. self-care, sphincter control, mobility, locomotion). Thus, 3 subsets consisting of 5–7 items were constructed.

Analysis of agreement between the 13-item motor FIM™ and the short subsets

To investigate agreement between the 13-item motor FIM™ and the short subsets, we used multivariate regression analysis and secondary Rasch calibration.

Regression analysis. The 13-item motor FIM™ scores (range 13–91 points) were estimated from the 5–7-item subset scores using multivariate regression analysis (21). The dependent variable in the equation was the actually measured 13-item motor FIM™ score and the independent variables were individual 5–7 item subset scores. We calculated coefficient of determination (R^2) as an index of agreement between the original simple summation of the 13 items and the estimated total score.

Secondary Rasch calibration. Although summation of item scores has been widely used for research and clinical practice, this is not theoretically adequate because the FIM™ is essentially an ordinary scale. To avoid this theoretical contradiction inherent in the regression approach, we used an additional method to estimate total motor FIM™ score by converting it into an interval scale. Using 5–7-item scores, we performed secondary Rasch calibration to derive individual logit score. The logit score reflects the relative level of functional independence in the group and can be adjusted to optimal point scale linearly, and handled as an interval scale (20). We reconstructed the 13–91 point interval scale from logit scores for comprehensive and easy comparison with the regression approach. Correlation coefficient (R) between reconstructed score derived from "primary" full 13-item and "secondary" limited-number-item Rasch calibrations in the same subject was calculated. To compare the accuracy of the 2 methods of estimation, the second power of correlation coefficient ($R^{2'}$) was raised.

Cross-validation studies

For cross-validation, the performance of the models developed was evaluated in the long-term care sample (group L) and the admission and discharge data of the recovery phase rehabilitation sample (group A and D). Total FIM™ score was estimated from the 5–7 item scores for each regression formulas derived from the model-constructing sample. Rasch calibration for subset score was performed to estimate total FIM™ score in the same way as model building agreement analysis. Reliability of the subsets was assessed by calculating intraclass correlation coefficients (ICC 3.1) (22).

Statistics

We performed Rasch calibration using a statistical software BIGSTEPS^TR^ (version 2.82 for DOS). ICC was figured out with a macro function written by one of the authors (SY) for Excel^TR^ (version 2002 for Windows^TR^). Other statistical calculations including regression analysis were performed with Statview^TR^ (version 5.0 for Windows^TR^).

RESULTS

The characteristics of our samples are listed in Table I. The mean age of the patients for model construction was higher than those of the stroke patients in the recovery phase (ANOVA, $p < 0.001$). The total motor FIM™ score was lower for this sample ($p < 0.001$). Differences in age and total FIM™ score between the model construction sample and the long-term care sample were not significant. Patients with stroke in the recovery phase were younger ($p < 0.001$) and total motor FIM™ score improved by approximately 6 points during inpatient rehabilitation.

Table II shows the results of primary Rasch calibration. The 13 motor FIM™ items were ordered according to their logit scores. Items at the negative end of the scale were considered "easier" and items at the positive end were regarded as more "difficult". "Feeding" was the easiest (−0.58 logits) and "Stairs" was the most difficult item (0.65 logits) for the model construction sample. The difficulty pattern corresponded to that observed in our previous study (18). Each item fitted to the Rasch model acceptably except bladder and bowel management items whose mean squares were more than 1.3.

The result of item selection for the subsets is illustrated in Fig. 1. Five items (Feeding, Bathing, Dressing lower-body, Bed/Chair/Wheelchair transfer, Stairs), which were located closely to the ideal distribution represented by 5 lines dividing logit range equally, were selected. "Grooming" and "Dressing upper-body" were excluded because carers had a tendency to help with these activities to save time. "Toilet transfer" was omitted because it depended considerably on circumstances in homecare settings in Japan. We added "Bladder management" to the above 5-item subset to cover the sphincter subcategory. Considering the clinical importance of locomotive function, "Walking/Wheelchair" was adopted for the 7-item subset. For this item, although walking and wheelchair abilities were assessed separately, we adopted either of the more commonly used ones for the patient as the final score following the UDSMR guideline (3).

The results of total score estimation are illustrated in Fig. 2. The subsets fit the regression model excellently (Fig. 2(a)). Multi-colinearity was not observed. Maximum correlation coefficient between variables was 0.90 (between 13 item total and Feeding), and the maximum variance inflation factor derived from this figures was 5.263 (< 10). Analysis of variance with the variables showed acceptable p values (<0.001). Regression analysis revealed that evaluation with 5 and more motor FIM™ items could predict the total score accurately ($R^2 > 0.95$). Scores derived from primary and secondary Rasch calibrations indicated linear distribution (Fig. 2(b)). $R^{2'}$ was as high as that derived from regression analysis with the 6-and-7 item subsets ($R^{2'} > 0.95$). The 5-item subset had lower correlation with the original estimation compared with other subsets ($R^{2'} = 0.927$).

The results of cross-validation studies are summarized in Table III. The subsets estimated total motor FIM™ scores accurately in the 2 cross-validation samples, particularly those derived from regression adjustment (ICC > 0.98). In general, estimation with Rasch calibration tended to show lower ICC values and the ICCs were higher with greater numbers of items.

DISCUSSION

Previous to this study, 2 other studies were available describing a short version of the FIM™. Mortifee et al. (15) reported a limited version of the FIM™ for patients with acute trauma. The set consisted of 3 items (Feeding, Walking, and 1 of the cognitive items "Expression"), and the scaling was simplified to 4 levels from the original 7 levels (7 = 4, 6 = 3, 5/4/3 = 2, 2/1 = 1). However, the set had poor consistency with the original FIM™ (ICC = 0.11) and was not useful practically. Dijkers & Yavuzer (16) developed another short version of the motor FIM™ for use in patients with spinal cord injury. They used 5 strategies to reduce the number of the motor FIM™ items from 13 to 5–7: random, coefficient alpha maximization, spread across the range of item difficulties, optimization by neurological category and individual optimization. The best performance was achieved by individual optimization 7-item subsets that selected the best-fit 7 items according to the disability level of each patient. The ICC between the estimated and the original data was > 0.98, and they concluded that the short version based on this algorithm approach was reliable and useful. However, there are several drawbacks with this algorithm approach for practical use in long-term care settings. First, the target population is different. Stroke occupies a significant proportion in long-term care instead of spinal cord injury. Secondly, understanding of the rating system of all the 13 motor FIM™ items is required to use the individual optimization 7-item subsets, which renders their model less practical.

Our study is the first to develop a short version of the FIM™ for use in long-term care settings. We demonstrated satisfactory performance of the short subsets; the ICCs in our model were as high as those of a previous study (16). The items included in our model are fixed in contrast to the individual optimization 7-item subsets adopted by Dijker & Yavuzer (16) that require selecting the best-fit 7 items according to the disability level of each patient. This renders it easier for the rater to master and use the

Table I. *Data for FIM items of the model construction and the cross-validation samples*

Group	M: model constructing			L: long-term care			A: recovery phase (admission)			D: recovery phase (discharge)	
n	398 (male 168, female 230)			169 (male 68, female 101)			187 (male 98, female 89)			187 (male 98, female 89)	
Age* (years)	79.3 ± 10.3			78.0 ± 11.2			63.4 ± 12.7			63.4 ± 12.7	
Motor FIM items	Mean ± SD	Median	IQR	Mean ± SD	Median	IQR	Mean ± SD	Median	IQR	Mean ± SD	Median
Self-care											
Feeding	4.18 (2.32)	5.00	2.50	4.94 (2.23)	5.00	1.50	5.34 (1.63)	5.00	1.00	6.02 (1.48)	7.00
Grooming	3.48 (2.50)	2.00	2.50	3.88 (2.37)	4.00	2.50	5.04 (1.98)	5.00	1.50	5.86 (1.81)	7.00
Bathing	3.29 (1.85)	3.00	1.88	2.81 (2.14)	2.00	1.50	3.11 (1.82)	3.00	1.50	4.46 (2.08)	5.00
Dressing upper body	3.29 (2.26)	3.00	2.00	3.36 (2.23)	3.00	2.00	4.14 (2.34)	4.00	2.00	5.55 (2.04)	7.00
Dressing lower body	2.78 (2.29)	1.00	2.00	3.20 (2.28)	3.00	2.00	3.81 (2.42)	4.00	2.50	5.27 (2.23)	6.00
Toileting	3.36 (2.51)	2.00	2.50	3.51 (2.35)	3.00	2.50	3.86 (2.38)	4.00	2.50	5.24 (2.15)	6.00
Sphincter control											
Bladder management	3.41 (2.40)	3.00	2.00	3.92 (2.59)	4.00	3.00	4.52 (2.50)	5.00	2.50	5.39 (2.23)	7.00
Bowel management	3.51 (2.37)	3.00	2.50	4.08 (2.51)	5.00	2.50	5.05 (2.21)	6.00	1.50	5.64 (1.84)	6.00
Mobility											
Bed/Chair/Wheelchair transfer	3.78 (2.43)	4.00	2.50	4.00 (2.38)	5.00	2.50	4.37 (1.92)	5.00	1.50	5.57 (1.70)	6.00
Toilet transfer	3.68 (2.44)	3.00	2.50	3.85 (2.34)	4.00	2.50	4.34 (1.94)	5.00	1.50	5.49 (1.75)	6.00
Tub transfer	3.11 (2.29)	2.00	2.50	2.86 (2.02)	3.00	2.00	3.59 (1.79)	4.00	1.50	4.63 (1.84)	5.00
Walk/Wheelchair	2.95 (2.22)	2.00	2.00	3.90 (2.40)	5.00	2.50	2.69 (2.26)	1.00	2.00	5.27 (1.83)	6.00
Locomotion											
Stairs	2.41 (2.00)	1.00	1.50	2.22 (1.82)	1.00	1.00	1.69 (1.75)	1.00	0.00	3.45 (2.45)	4.00
Total score*	43.2 (25.1)	39.00	23.00	46.5 (26.0)	49.00	26.00	51.5 (22.7)	5.00	1.00	67.9 (22.4)	76.00

IQR = inter quartile range; SD = standard deviation.
*: $p < 0.001$ ANOVA.

Table II. *Results of the 13-item Motor FIM Rasch Calibration*

Item	Logit value	SE	MNSQ
Stairs	0.65	0.05	1.24
Dressing lower body	0.37	0.04	0.69
Walking/Wheelchair	0.25	0.05	1.22
Tub transfer	0.14	0.04	0.80
Dressing upper body	0.02	0.04	0.92
Bathing	0.02	0.04	1.11
Toileting	−0.03	0.04	0.86
Bladder management	−0.06	0.05	1.36*
Grooming	−0.10	0.04	1.13
Bowel management	−0.13	0.05	1.48*
Toilet transfer	−0.24	0.04	0.59
Bed/chair/WC transfer	−0.31	0.04	0.63
Feeding	−0.58	0.04	0.99
Mean (SD)	0.00 (0.30)	0.04 (0.00)	1.00 (0.27)

SE = standard error; SD = standard deviation; MNSQ = mean square variance ratio statistic (infit).
*: Misfit >1.3.

instrument, which is particularly beneficial in home care settings where time for evaluation is limited. Furthermore, the evaluation results can be easily converted to 13-item motor FIM™ scores using the Rasch model or the regression formulae.

With the regression approach, total FIM™ score was predicted accurately using only the 5-item score. Accuracy of the estimation with Rasch calibration was lower than that of the regression approach. Some concern remains regarding the application of the Rasch model. In cases of extremely dependent or independent persons, estimated FIM™ scores using Rasch calibration become inaccurate because of its theoretical feature (21). As shown in Fig. 2(b), both ends of the plots tend to be out of the ideal linear distribution compared with those of regression analysis. $R^{2'}$ for the 5-item estimation was lower than 0.95. Judging from these observations, at least 6 or more items seemed necessary to be able to satisfactorily describe heterogeneity of patients. Although we built a 7-item subset to secure higher consistency, no remarkable difference was observed in the evaluation accuracy between the 6-item and the 7-item subsets. Therefore, we suggest the 6-item subset as a practical solution (Feeding, Bathing, Dressing lower-body, Bladder management, Bed/Chair/Wheelchair transfer, Stairs).

The performance of the short subset was cross-validated in 2 independent samples, 1 with patients with mixed disabling conditions in the chronic phase and the other with patients with stroke in the recovery phase rehabilitation. In particular, scores adjusted with Rasch calibration showed superior correlation

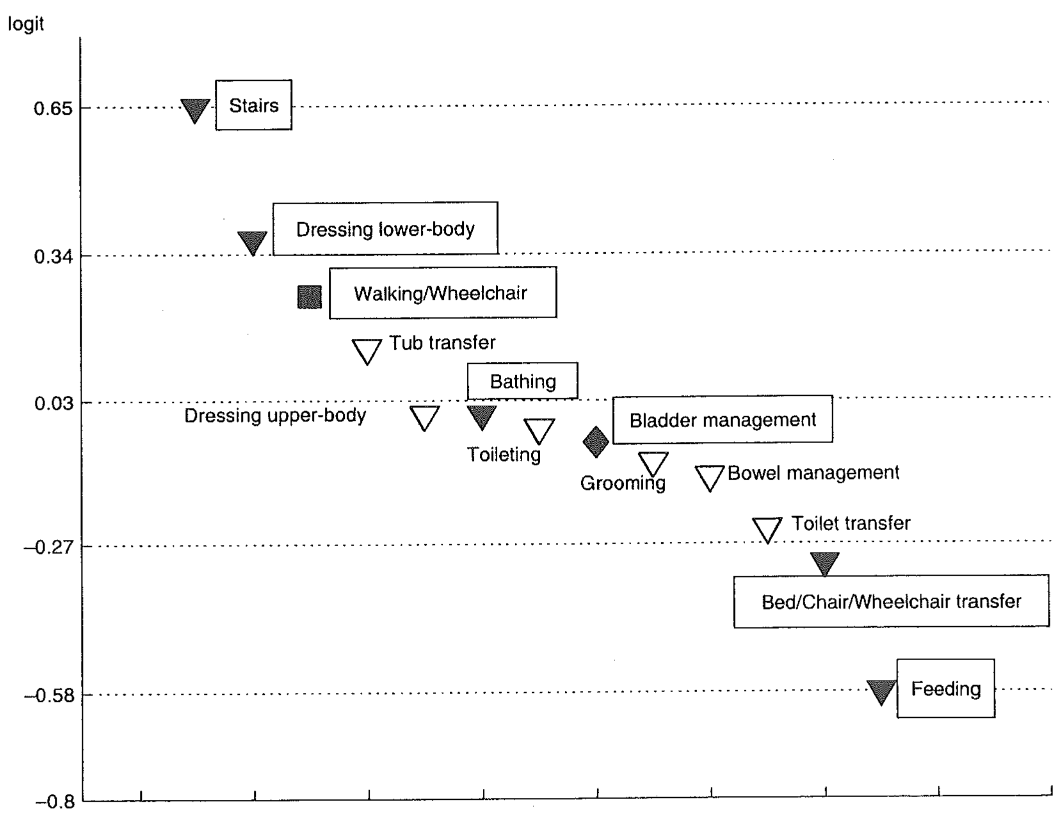

Fig. 1. Spread of item weights and item selection. ▼: 5-item subset; ◆: additional item for 6-item subset; ■: item adopted to 7-item subset; ▽: others. Horizontal dotted lines divides range of logit score into 5 with equal intervals.

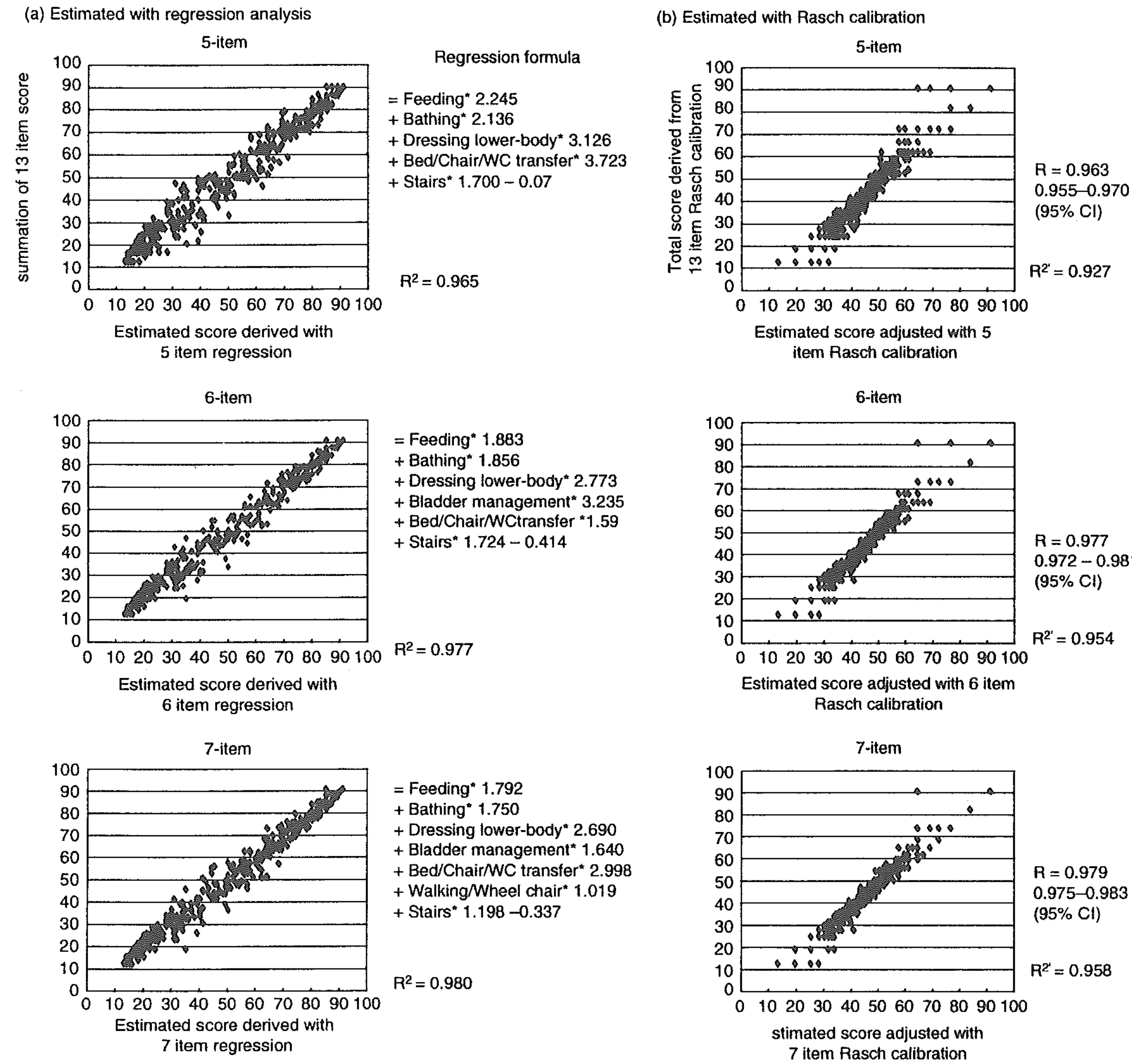

Fig. 2. Results of agreement analysis between the original 13-item motor FIM score and the estimated motor FIM score with the subsets. Scatter plots depicting the relationship between the original 13-item motor FIM score and estimated total FIM score using the subset score. A = simple summation of 13 items and estimated total FIM score derived from regression formulas with 5 to 7 items; B = total FIM scores adjusted with 13 item and 5–7 item Rasch calibration; R^2 = coefficient of determination; R = correlation coefficient; CI = confidence interval; $R^{2\prime}$: 2nd power of correlation to coefficient.

with those in the model building procedure. This was presumably because the influence of the floor effect was minimal in patients with stroke. Our model could therefore be used to document functional status consistently from the recovery phase to the community phase, and the regression formula we described would be a great help to compare short subset scores with the fully assessed 13-item scores. Rasch calibration would be of use when a strict interpretation of scaling is required.

There are several limitations in our study. Because we could only obtain data from a small cluster of the people (398 of 1710 persons), the first limitation concerns with a possible selection bias for the model-building sample. The relatively high refusal rate could be explained partly by the fact that in Japan there is still a tendency to hide persons with disability from society, particularly among the aged population. The representativeness of the sample should therefore be interpreted with caution.

Secondly, we did not examine the influence on the remaining items of removing items when developing short subsets. When some of the items in the original scale are no longer administered, it can affect how the rater scores the remaining items. In future studies, we need to examine validity and reliability of the short versions *per se*.

Table III. *Correlation between the estimated and original total FIM score*

	Subset					
	5-item		6-item		7-item	
Adjustment	ICC	95% CI	ICC	95% CI	ICC	95% CI
Rasch						
group M	0.958	0.969–0.979	0.975	0.973–0.982	0.979	0.980–0.989
group L	0.977	0.969–0.983	0.986	0.981–0.989	0.989	0.985–0.992
group A	0.974	0.965–0.980	0.978	0.970–0.983	0.987	0.982–0.990
group D	0.964	0.952–0.973	0.971	0.961–0.978	0.981	0.974–0.985
Regression formulae						
group M	0.982	0.978–0.985	0.988	0.985–0.990	0.990	0.987–0.991
group L	0.985	0.980–0.989	0.994	0.992–0.995	0.995	0.993–0.996
group A	0.980	0.973–0.984	0.987	0.982–0.990	0.991	0.987–0.993
group D	0.987	0.982–0.990	0.990	0.987–0.992	0.994	0.991–0.995

Group M = model constructing; L = long-term care; A = recovery phase (admission); D = recovery phase (discharge); ICC = intraclass correlation coefficient; CI = confidence interval.

Thirdly, the number of items (6) we recommended is not necessarily minimum. Focusing on specific population may make it possible further to reduce the number of items needed for reliable estimation.

Finally, although we demonstrated that our model could be used not only in the community phase but also in the recovery phase of rehabilitation, our study was limited because of its cross-sectional nature. In general, a shorter version is not suitable for catching trivial changes, and we need to investigate its responsiveness to changes over time in future longitudinal studies.

Despite these limitations, we consider that the short version of the motor FIM^{TM} we developed is a simple and useful measure of functional ability, not only in long-term care but also in recovery phase rehabilitation settings. It is easier to master and less time-consuming to administer than the full version of the motor FIM^{TM}. Based on an evaluation with a common scale, more integrated rehabilitation interventions from the acute to the community phase would become possible.

ACKNOWLEDGEMENT

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仮の要介護状態とその対策

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仮の要介護状態とは

「仮の要介護状態」とは，介護が必要ないわゆる要介護状態にあっても，適切なリハビリテーション（以下，リハ）を行えば，日常生活動作（ADL）や介護負担度が改善する余地がある，いわば見せかけの要介護状態をさす．在宅要介護者の中には要介護状態が“仮”であるまま，現状に合わせた介護サービスを受け続けているケースが少なからず存在すると考えられるが，本来は介護サービスの利用が検討される前に，潜在的に到達可能なレベルまで機能，能力を高めるためのリハ介入が行われていなければならない．すなわち，リハ前置主義の実践である．

臨床場面における「仮の要介護状態」の疾病構造を図1に示す．脳卒中や骨関節疾患などの発症により急激にADLが低下したケースが維持期において仮の要介護状態に陥ってしまうのは，①急性期，回復期のリハが不十分であるまま自宅へ退院，維持期へ移行し，介護サービスを利用している場合，あるいは②入院時に適切なリハを受け自宅に退院したが，いわゆる廃用や疾病の合併，増悪によって機能や能力が低下し，適切なアセスメントがなされないまま放置されている場合などが想定される．大局的な視野からこれらの仮の要介護状態に対する対応策を考えた場合，在宅要介護者の中からリハ適応のあるケースをスクリーニングし，適切な介入へつなげるためのシステムを構築することが必要であると考えられるが，これらは現行の介護認定制度において解決すべき課題の一つである．

一方，厚生労働省老人保健福祉局内に設置された「高齢者リハビリテーション研究会」は，急性

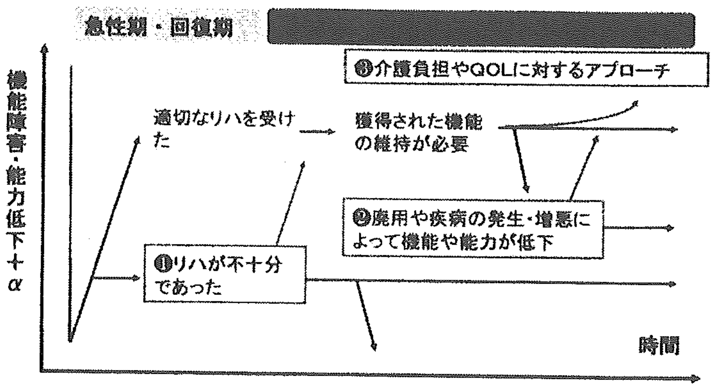


図1　仮の要介護状態（文献1)より，一部改編）

発症を起点とした従来の脳卒中モデルでは描出しきれない，徐々に生活機能レベルが低下するという廃用症候群モデルを提示し，介護予防の重要性を説いている．介護保険制度の見直しにおいても，要支援，要介護1度に相当するレベルでの生活機能低下予防として介護予防に重点が置かれ，これまでにも介護予防給付や高齢者筋力増強プログラムなどの対応策が推進されてきている．しかし，脳卒中慢性期患者などのように，より要介護度の高い，すでに要介護状態に陥ってしまった場合への対応については，定まった方向性が示されていない．こうしたケースこそ，本来の専門的リハ介入が必要となる“廃用”のハイリスク群に当てはまると考えられ，こうした状態に対する治療的リハ介入の方略については今後の検討が必要である．

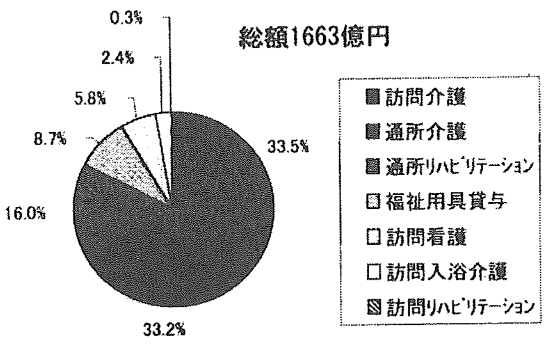
介護保険制度とリハビリテーション

仮の要介護状態は維持期におけるリハが抱えている構造的問題であるといえるが，一方で，その解決へ向けた基盤となる専門的リハのサービス供給体制にも大きな問題が存在している．ここで，介護保険制度下におけるリハサービスの現状を振り返ってみたい．

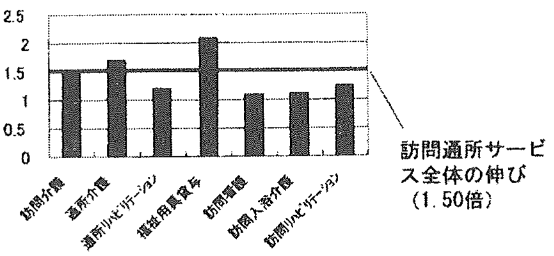
慶應義塾大学医学部リハビリテーション医学教室では，東京都世田谷区が第3セクターで運営している訪問リハ事業（世田谷区総合福祉センター介護保険リハビリ係）にスタッフを派遣している．世田谷区総合福祉センターでは主に地域のケアマネジャーからの依頼を受け，リハ医が介護保険サービス利用者の自宅を訪問して診察を行い，リハの適応判定から処方，管理に携わっている．こうした訪問リハ事業の最前線での現場の印象も踏まえて，以下に介護保険制度とリハをめぐる問題点について考察する．

介護保険制度における在宅要介護者を対象とした専門的なリハサービスとしては，訪問リハ，通所リハ，および訪問看護としての訪問理学療法，作業療法（訪問看護7）が挙げられる．2005年3月の厚生労働省の統計[2]によれば，各サービスが訪問通所サービス全体の給付額（1663億円）に占める内訳としては，訪問介護が30%以上であるのに対して，通所リハは16%にとどまり，訪問リハに至ってはわずか0.3%の割合に過ぎない（図2A）．2002年3月と比べた各部門の費用の伸び率では，総額で1.50倍の増加が見られる中で，通所リハ，訪問リハはいずれも約1.2倍の伸びにとどまっている（図2B）．このように，介護保険制度におけるリハは，その需要の増大に対し普及が進んでおらず，仮の要介護状態に広く対応するべきこれらのリハサービスの供給体制は十分に整っていないのが現状である．

こうしたそもそものサービス供給量自体の不足を背景として，在宅介護の訪問リハの現場では，専門的リハの認識不足に起因するかかりつけ医のリハ処方能力，ケアマネジャーのマネジメント能力が問題となっている．認定審査時のかかりつけ医意見書においては，利用が望ましい介護保険サ



(A)



(B)

図2　(A)サービス別介護保険費用の割合（2005年3月）(B)介護保険費用の伸び（2005年3月と2002年3月の比）

ービスについてチェックする項目が用意されているが，有効に活用されているとは言い難い．また，訪問看護指示書においてリハを指示する項目も，リハ科専門医から見れば，いわゆる「お任せ処方」の温床に過ぎない．理学療法士（PT），作業療法士（OT）が従事している訪問看護ステーションはまだしも，多くのケースではこれらの指示書に基づくリハ処方は，看護師により手探りで行われているのが現状である．看護師の対応も事業所によって大きな温度差がある．一方，ケアマネジャーの質にもばらつきが多く，医学的知識に著しく欠ける管理によって，廃用が見逃されるのみならず，廃用を進行させてしまうケースも少なくない．居宅介護支援事業所の母体によっては，系列事業所のサービスが優先的にケアプランに組み込まれてしまう傾向も存在する．さらに，専門的リハの提供を謳う一部の医療類似行為事業者の存在も，看過し難い問題である．

また，一般の患者，介護者と，我々専門家が認識している“リハビリテーション”という概念の隔たりも維持期においてリハサービスを提供する上で様々な障害となる．「手が動くようにならないのであれば意味がない」と機能障害に固執し，受容と適応に問題があるケースも存在すれば，仮の要介護状態にある者がサービス提供を受けられないでいる一方で，「家族の代わりに一緒に散歩に行って欲しい」，単に「体を起こして動かす時間を確保したい」，あるいは「疼痛緩和のために体をさすって欲しい」などの要望を訪問リハの内容として求められることも少なくない．

以上のように，現行の介護保険制度においては，リハサービス供給量の絶対的不足に加えて，「リハ」の意味するところの共通認識が未確立であることが効率的なサービス提供の妨げとなり，仮の要介護状態が放置されている現状につながっている．専門家たる我々リハ医は，医師と看護師，PT，OT，あるいは言語聴覚士（ST）の役割と，患者本人，家族，介護者を含めたそれぞれの立場で取り組むべき内容を明確に示した上で，仮の要介護状態を的確に判断し，リハサービス提供にかかわるマネジメントを的確な方向に指導していかなければならない．

仮の要介護状態の実態

次に，在宅要介護者における仮の要介護状態の実態について，2001年から厚生労働科学研究として行ってきた調査研究（脳卒中による機能障害および能力障害の治療および訓練に関する研究―維持期におけるリハビリテーション医療とその効果―：主任研究者　千野直一）[3]の結果を一部紹介する．

我々は全国58施設の協力を得て作成した1,129名の維持期症例データベースの中から，訪問看護サービスを利用中でリハを行っていない40歳以上の脳卒中患者125名（男性55名，女性70名，平均年齢81.9±9.3歳）を抽出し，仮の要介護状態をもたらす要因について解析した．要因の有無とリハ介入による改善の可能性を担当看護師が判断した結果では，多くの症例が筋力低下（109名），体力低下（91名），ならびに歩行障害

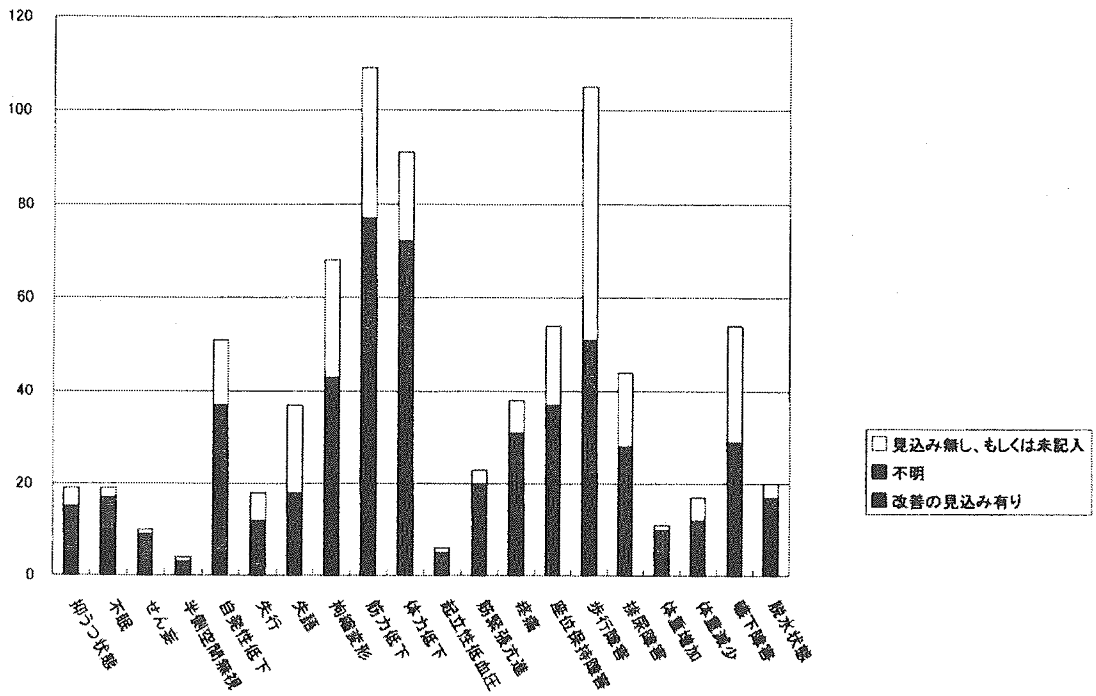


図 3 訪問看護師による仮の要介護状態スクリーニングの試み
在宅療養中でリハを行っていない症例を抽出（n＝125）

（105名）を呈しており，筋力低下，体力低下に対しては半数近くが改善の見込みがあると看護師は判断していた（図3）．これらの判断はあくまで看護師の視点からのものであり，過大評価や過小評価，見逃しなどが少なからず含まれているが，全体では82名（65.6％）の症例が何らかの改善の余地があると判断されており，可逆的な要素を残したまま在宅療養を行っている，つまり仮の要介護状態にあるケースが多く存在し，その多くは廃用によって作られていることが浮き彫りとなった．一方で見通しが不明と判断されるケースも全体の36.7％にのぼった．本来はこうしたケース全てにリハ科専門医が関わりを持ち，適応判断と介入というプロセスが開始されるべきであるが，在宅でリハを管理できる専門医師の不足はあらためて言及するまでもない．

仮の要介護状態に対する対応

1. 仮の要介護状態スクリーニング

我々はこれらのデータと，関連する専門職の意見をふまえ，リハ科専門医が診察を行わずとも，ケアマネジャーや看護師でも専門的リハの必要性についての判断が可能となるようなツールとして，「運動器リハビリテーション適応患者判定シート」（以下，判定シート）を作成した（図4）[9]．判定シートは在宅要介護者を対象とし，能力低下の有無（トリガー），症状の経過（経過），訓練を遂行しうるかどうかにかかわる認知能力（適応）について問う項目を用意し，回答が一定の条件に適合するケースをリハの適応ありと判断するよう設計されている．

現在，その判定精度について予備的なデータを収集中である．慶應義塾大学病院の所在地である東京都新宿区に拠点を置く訪問看護事業所の協力を得て，リハ科専門医が自宅を訪問して診察を行い，下した専門的リハの適応判定と，看護師が判定シートを用いて行った判定がどの程度一致するかを検証した結果を紹介する．対象は悪性腫瘍等で終末期医療の対象となっているケースを除く90歳以下の利用者25名（男性10名，女性15

運動器リハビリテーション　適応患者判定シート

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対象：40歳以上の在宅療養者で、専門的リハビリを受けていないケース
適応：A,B,C全てのカテゴリーにおいて、最低一つはあてはまる項目がある

患者氏名

A:トリガー

【　】歩行が困難となった（下位項目にもチェックを入れて下さい。）
　【　】屋外を歩けなくなった
　【　】屋内を歩いて移動できなくなった
　【　】階段の上り下りが困難となった。

【　】トイレ動作が困難となった
　・ズボンの上げ下げに介助が必要となった

【　】ベッド、車椅子、ポータブルトイレ、浴槽など乗り移りが困難となった

【　】ベッドからの起き上がりが困難となった

【　】座位（端座位、車椅子座位）をとることが困難となった
　・座っている姿勢が著しく傾いて保持できない

B:いつから	要因　　※()該当の場合いずれかに○
■6ヶ月もしくは1年以内	【　】骨折、転倒（6ヶ月以内／1年以内）
	【　】麻痺の増悪（6ヶ月以内／1年以内）
	【　】肺炎、膀胱炎などによる長期臥床（6ヶ月以内／1年以内）
	【　】脳血管障害（6ヶ月以内／1年以内）
■期間によらず	【　】拘縮の進行
	【　】痛み（関節痛、神経痛）
	【　】パーキンソン病
	【　】うつ病、痴呆の進行
	【　】その他精神神経疾患（統合失調症など）
	【　】肥満
	【　】その他（　　　　）

C:適応

【　】本人にリハに対する意欲がみられる

【　】介護に対して協力する姿勢がみられる

【　】手すり等があれば座位を保持していられる

【　】簡単な口頭指示に従うことができる

図4　運動器リハビリテーション適応患者判定シート
・専門的リハ介入を想定し，40歳以上の在宅療養患者を対象とする．
・トリガー，経過，適応の3つのカテゴリーから構成され，それぞれのカテゴリーで最低1カ所当てはまる項目がある場合，専門的リハ適応と判断する．

名，平均年齢80.0±11.2歳）で，リハ科専門医ならびに判定シートによって下されたリハ適応に関する判定結果を表に示す．専門医による診察の結果，7名が専門的リハの“適応あり”と判断されたが，判定シートではこのうち6名が陽性（“適応あり”）となった．“適応なし”は18名のうち17名で判定が一致した．陽性反応的中率は0.86，陰性反応的中率は0.94，感度，特異度はそれぞれ0.86，0.94と良好な結果が得られた[9]．現在，他の地域でも調査を進行中であるが，リハサービス普及の程度によって判定精度にばらつきがみられるため，実用化へ向けた項目の

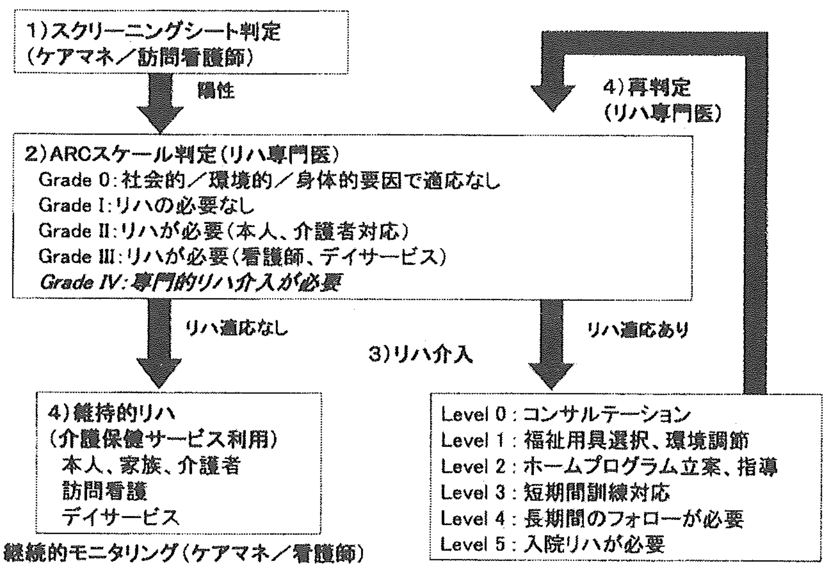
表 リハ適応患者判定シートの信頼性評価

A：リハ科専門医診察と判定シートの結果比較

	リハ適応	判定シート結果		計
		あり	なし	
リハ科専門医	あり	6	1	7
診察結果	なし	1	17	18
	計	7	18	25

B：判定シートの精度

感度	0.86
特異度	0.94
陽性反応的中率	0.86
陰性反応的中率	0.94



ARCスケール：Active Rehabilitation Classification Scale

図5 在宅リハ介入モデル構想

見直しを進めている．

2. 在宅リハ介入モデル構想

判定シートを用いたスクリーニングの可能性を示したが，在宅要介護者の病態は多様であり，画一的にリハ適応を判断するのみではリハサービス運用の効率化に限界がある．我々はスクリーニングから始まり，専門医の診察，適切なリハ処方，介入へとつながる一連のシステム構築を目指して「在宅リハ介入モデル構想」を立案し，東京都世田谷区における地域レベルのプロジェクトとして訪問リハ事業所，訪問看護事業所とともにその具体化を進めている．モデル構想の概要を図5に示す．

在宅要介護者を対象に判定シートを用いて一次スクリーニングを行った後，陽性例にはリハ科専門医が診察を行う仕組みであるが，特にリハ適応判断の内容については，専門的リハとそれ以外の本人，家族，介護者，看護師が行うリハの位置づけを明確化できるよう，新たに考案したActive Rehabilitation Classification Scale（ARCスケール）をリハ介入の指標として盛り込んでいる．ARCスケールは必要となる広義のリハの段階をグレード化（0～IV）し，さらに必要となる専門的リハの内容についてはそのレベル（0～5）を設定するものである．また，ARCスケールはリハ処方の大枠を規定するのみならず，リハ介入効果判定のための指標としての利用も想定している．ARCスケールを基軸とすることで，リハ介入と効果判定，廃用防止のための維持的なリハへの移行，継続的モニタリングというシーケンスを円滑にすすめることが可能となる．モデルの運用を通じてリハ資源の重点的再配分を進め，専門的リハ