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THE FUNCTIONAL INDEPENDENCE MEASURE IN SWEDEN: EXPERIENCE FOR OUTCOME MEASUREMENT IN REHABILITATION MEDICINE

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ABSTRACT. The purpose of the study was to describe the Functional Independence Measure (FIM) in Sweden and to analyse some aspects on its structure and the possibility to predict length of stay in a rehabilitation ward. It assesses the degree of dependence with 13 physical and 5 social and cognitive items, using a 7-level ordinal scale. Data are presented from a total of 312 patients and from 267 first admission patients with a mean age of 45 (SD 13) years, 66% being men, in rehabilitation medicine wards in three hospitals in Sweden. The patients were divided into six diagnostic groups. Ratings were made at admission and at discharge. The level of dependence in physical and social cognitive items was reduced during the stay at the ward. Using Rasch analysis, separate physical and social-cognitive items and personal measures were obtained on a linear scale. It was demonstrated that the relative order of the items was similar at admission and discharge. There were minor differences between diagnostic groups for the physical items, whereas more diagnostic-specific differences were seen for the social-cognitive items, for stroke patients with and without aphasia. Individual statistics were used for demonstrating FIM changes during the rehabilitation period. There was a high correlation between admission and discharge FIM values, and the admission FIM (physical items) accounted for up to nearly 50% of the variation in length of stay in a homogeneous sample such as stroke patients, but for less than 40% in the total sample. FIM can be used to follow changes during in-patient rehabilitation and for comparisons between different rehabilitation units.

Key words: functional assessment, disability, rehabilitation medicine, stroke, brain injury, Rasch analysis.

One of the primary clinical objectives in rehabilitation medicine is to reduce the degree of disability. To meet the need to measure patients' abilities in this area, the Functional Independence Measure (FIM) was developed by a joint task force of the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation (13). Introduced as a generic instrument it was intended to be used as a uniform measure of disability, in terms of independence/dependence, and could therefore be assumed to be suitable for assessments of functional outcome. On the recommendations of clinicians the original 4 levels were increased to 7 levels in order to enhance sensitivity. FIM consists of 18 items, which could be separated into two domains (18), in the present paper called Physical (13 items) and Social & Cognitive (5 items). They have also been grouped into six subscales, as in the reports by the Uniform Data System (UDS) (6, 8, 10). Examples of the areas for which FIM are used are to describe a case mix, to indicate changes in functional status, particularly during in-patient rehabilitation, to predict outcome, and to estimate care requirements. It has been tested for inter-rater reliability (1, 3, 15), reliability for repeated ratings (20), construct validity and discriminative capability (2), and also for construct validity with respect to the amount of care given in the home to multiple sclerosis and stroke patients (4, 7). Admission status has been found to be consistently associated with discharge status and length of stay, and physical (motor) items have proved to be a more important predictor of length of stay than social and cognitive items (17).

FIM was translated into Swedish and introduced in Sweden by us (11), and many clinicians have been interested in using it. In order to study some of its dimensional characteristics in comparison with previous reports (9, 16, 18) and explanatory power for functional changes during rehabilitation and length of stay in a rehabilitation ward, data were collected from consecutive patients from rehabilitation wards at three Swedish hospitals during 1992 and 1993. In addition, the report also provides descriptive information concerning functional abilities at admission and discharge in various patient groups.

By using Rasch analysis (22) to obtain interval-scaled measures from the ordinal scale, the three departments were able to compare difficulties with FIM items and findings related to the various diagnostic groups, and then to make comparisons with previous American reports (17). Differences in calibration between admission and discharged FIM ratings were analysed, and statistical changes with time in individual patients could be identified.

MATERIALS AND METHODS

Patients

FIM was used in departments of rehabilitation medicine at three university hospitals during 1992–1993 with 312 consecutive patients staying in the wards for more than 2 weeks; 267 of the patients had been admitted to rehabilitation for the first time, the average age of the patients being 45 (SD 13) years. Two of the hospitals are in the Stockholm area (called A and B) and one in Göteborg (called C). The number of beds in the three departments was 22, 15 and 22, respectively. At the time of the study, 12 of the beds at the C department were only for use 5 days a week (weekends to be spent outside the ward), which had some impact on the patient selection. All three hospitals admitted most of their patients from acute wards at the same or other hospitals in the same region and with special orientation towards patients with neurological diseases or trauma. In Sweden, elderly patients are usually referred to departments of geriatrics for their rehabilitation, so that the case mix has a relatively low mean age.

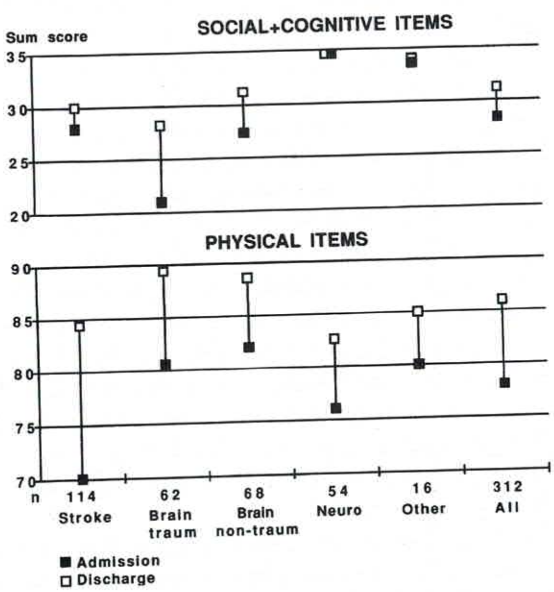

Fig. 1. Median values of added FIM scores for physical (A–M) and social-cognitive (N–R) items at admission and discharge in totally 312 patients at three rehabilitation medicine departments. Results are presented for six diagnostic groups.

Data are presented from all 312 patients in Figs. 1–3 and only for first admission patients in the other Figures and Tables. The distribution of patients in the diagnostic groups (as essential as in UDS reports, see [10]) with first admission to rehabilitation (87% of all patients), age and sex are seen in Table I. The average length of stay was similar in the three hospitals, and nearly all patients were discharged to their home or to complete their rehabilitation at another unit. The remaining patients were either discharged to acute clinics or to department of geriatric medicine or nursing home. The skewed distribution of time since onset of the present disease and length of stay (LOS) at the rehabilitation ward is demonstrated by the relatively large difference between mean and median values. Ninety-four per cent of the patients had a neurological diagnosis and a rather large proportion were middle-aged stroke patients, especially in C. Departments A and B had the largest proportion of patients with traumatic and other brain injuries. There were only few patients with traumatic spinal cord injury in the case mix, as these patients are treated in special units in Sweden. All patients with neurological diseases or trauma not involving any clinically defined brain injury were therefore treated together. The group "other diagnoses" contained mainly orthopaedic patients.

Methods

The Functional Independence Measure (FIM) assesses self-care, sphincter management, transfer, locomotion, communication, social interaction and cognition in 18 items, as presented in Table II. It uses a 7-level scale anchored by extreme ratings of total assistance as 1 and complete independence as 7; the intermediate levels are 6 = modified independence, 5 = supervision or set-up, 4 = minimal contact assistance or the subject expends 75% or more of the effort, 3 = moderate contact assistance or the subject expends 50–75% of the effort, 2 = maximal assistance or the subject expends 25–50% of the effort (see 13, 15). FIM data were assessed at admission during the first week of stay at the rehabilitation ward and at discharge during the last week. Members of the rehabilitation team involved (attending physician, nurse, occupational therapist and physiotherapist) made the assessments at a short team conference on the basis of their previous observations. The inter-rater reliability will be presented in a subsequent report (Daving-Götberg et al, unpublished data), but no major inter-professional differences were found.

Rasch analysis of FIM items was made with BIGSTEPS (22), a standard computer program for the analysis of rating scale data. The Rasch analysis uses the relative difficulty in performance of items and the relative ability of the persons assessed. For each parameter BIGSTEPS obtains an estimated value ("measure"), a standard error for that estimate, and fit statistics, indicating the extent to which the model specifications of unidimensionality have been usefully met by the data. The scaling units are logits, log-odds units, expressed around its mean value set at zero. Distinction is

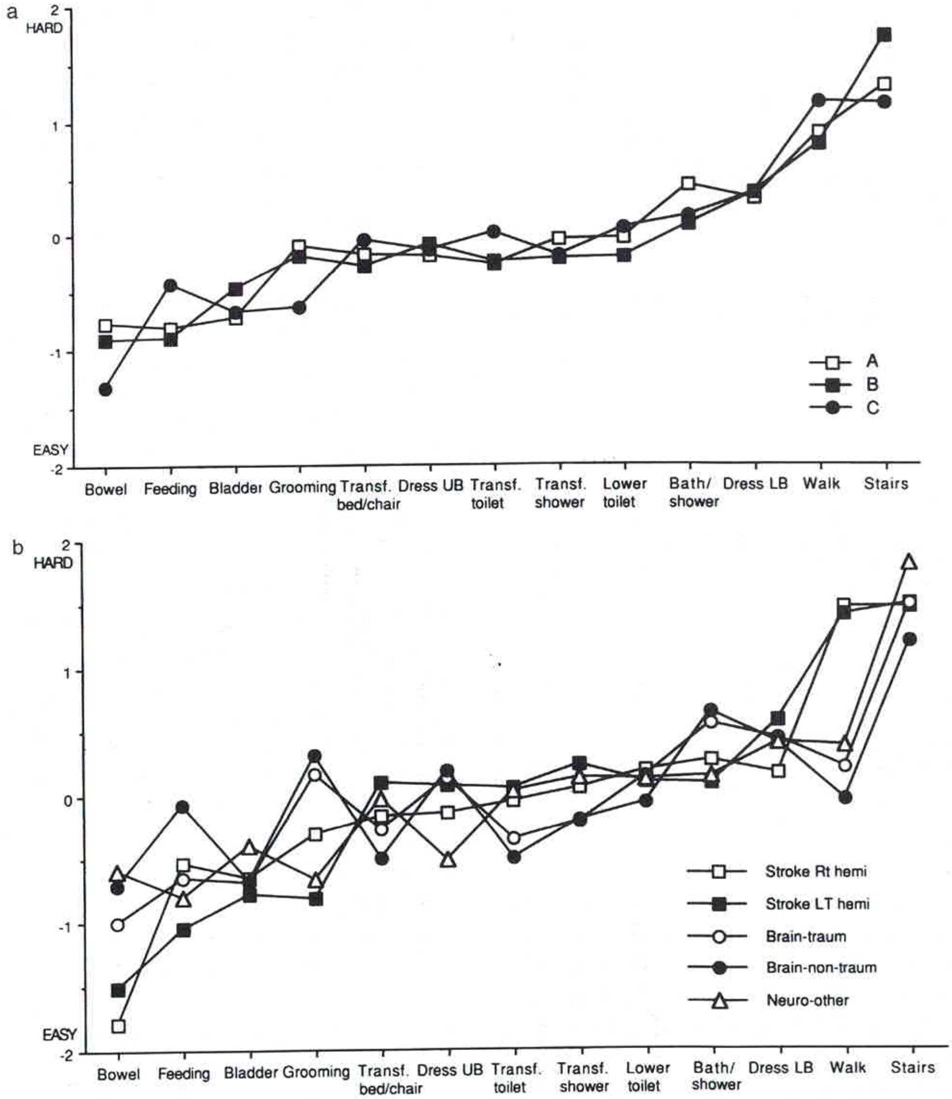

Fig. 2. Item logits from Rasch analysis at admission for physical items in the three participating hospitals (*a*) and for different diagnostic groups (*b*). Note that for walk only scores from walk (not including wheelchair) assessments were used. The center of the Rasch scale is set to 0.

made between "measures" from the Rasch analysis and "raw scores" directly from the ordinal scale in FIM. We are well aware of the principle error in adding scores from ordinal scales, but have done so to allow comparison with other published data.

By obtaining measure values on a linear scale, we were able to use ordinary parametric statistics. For the ordinal (raw scale data), non-parametric statistics were used for comparison of individual changes from admission to discharge. Multiple regression analysis were performed with length of stay (and its logarithm) as a dependent variable and age, sex and FIM data (raw scores and measures in logits) and changes in FIM from admission to discharge as independent variables.

RESULTS

The results from all three departments are treated together, as no major difference in the structure, with the exception of some differences in the case mix, was noted, which was also confirmed at consensus discussions of rehabilitation strategies and programmes on several occasions. The dimension analysis described below further confirmed the similarity in the use of FIM ratings in the three departments. In Table III, FIM average raw scores for different item groups (10,

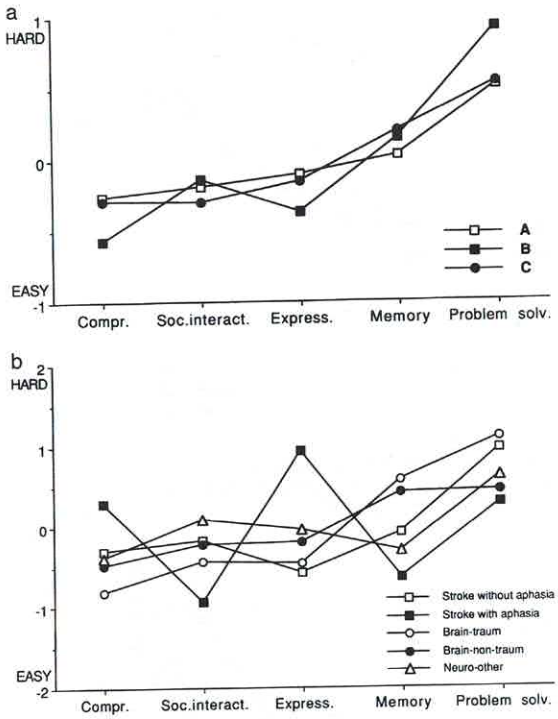

Fig. 3. Item logits from Rasch analysis at admission for social and cognitive items in the three participating hospitals (*a*) and different diagnostic groups (*b*). The center of the Rasch scale is set to 0.

see also Table II) are shown at admission and discharge for different diagnostic groups in patients admitted for the first time to rehabilitation. Seven per cent of the total sample were admitted for follow-up, and 6% were re-admitted for rehabilitation, but these are not included. The raw FIM scores were added up for physical (items A–M) and social and cognitive items (N–R), as can also be seen in Fig. 1. They represent, however, all patients studied, and show a significant increase ($p < 0.001$) from admission to discharge in all groups, except for social and cognitive items in non-neurological diagnoses where the significance level was $p < 0.02$, and in neurological diseases without brain injury where there was no significant change. The lowest admission and discharge average scores for physical items were seen in patients with stroke and neurological diseases without brain injury, and for social and cognitive items in traumatic brain injury patients. In general, the level of dependence was slight to moderate at admission, the patients on average requiring minimal assistance or even only supervision. However, some groups required more assistance in transfer and locomotion, while those with traumatic brain injuries needed more help with the social and cognitive items. At discharge most items were on average close to or at the modified independence level, except for locomotion in patients with stroke and neurological diseases without brain injury and social-cognitive items in traumatic brain injury patients, for whom somewhat more dependence was recorded.

For further data treatment Rasch analyses were performed. The distribution of items concerning their "difficulty", i.e., how easy or hard it is to achieve high scores, showed rather good agreement between the hospitals (Fig. 2*a* and 3*a*) bowel and feeding being the easiest physical items and, as expected, stairs the hardest. Differences may most likely be explained by a somewhat different case mix (Table I), hospital C having for instance the highest number of stroke patients. The agreement between the diagnostic groups was also good (Fig. 2*b*) and differences here may also be explained by the characteristics of the different diagnostic groups. Thus, eating was a harder item in the non-traumatic brain injury group and walk in both stroke groups than in the other groups, and grooming more difficult in the groups with traumatic and other brain injuries. Among the social and cognitive items, memory and problem-solving were the hardest, except for stroke patients with aphasia, in whom expression was the hardest item (Fig. 3*b*). The social and cognitive items seem to be more diagnosis-sensitive than the physical items. It may be noted that separate calibration was made with the Rasch analysis for the different hospitals and diagnostic groups, giving different, although fairly similar, measuring scales. Thus, statistical analysis of differences between the measure values presented in Figs. 2 and 3 has not been performed. With the differences in calibration between the diagnostic groups, it was decided to use separate calibrations for calculation of individual measure values, even if nearly the same results were obtained for the physical items with joint calibration for all diagnostic groups (cf. 16).

Separate item calibration at admission and discharge showed acceptable agreement with item measures along the identity line, as illustrated in Fig. 4*a*, for joint calibration for the physical items, and in Fig. 4*b* and *c* for calibrations for the social and cognitive items in stroke patients with and without aphasia. Thus, data can be used for comparison of patient status at admission and discharge, and individual

Table I. *Distribution of diagnoses (grouped according to given ICD code), age, sex, time after onset to admission to rehabilitation, length of stay in rehabilitation ward and where to be discharged in 267 first-admission patients at three departments of rehabilitation medicine*

	Hospital			
	A	B	C	Total
n	86	79	102	267
Diagnoses, % distribution				
– Stroke	26	20	62	37
– Traum. brain inj.	27	27	6	19
– Other brain inj.	23	24	19	22
– Other neurolog. dis.	15	20	14	16
– Other diagnoses	9	9	0	6
Age, years, mean (SD)	43 (13)	40 (13)	50 (12)	45 (13)
Sex, % men	77	60	62	66
Time after onset, days				
– mean (SD)	56 (73)	54 (81)	65 (78)	59 (77)
– median	31	26	38	33
Length of stay, days				
– mean (SD)	77 (56)	71 (57)	84 (62)	78 (59)
– median	61	54	60	60
% discharged				
– to community,	89	73	87	84
– to other rehab	5	9	4	6

measure values were also used to analyse changes from admission to discharge. For this purpose, a calibration using admission and discharge data together was used. There was a linear relationship between sum scores and measure values in the middle range of scores, whereas "ceiling" and "floor" effects were demonstrated at low and high scores with larger measure changes compared to score changes. There was, however, essentially no difference in these relationships between admission and discharge calibrations.

Table II. *FIM items grouped as presented in Table III*

Physical items
- Personal care
  - A. Feeding
  - B. Grooming
  - C. Shower, bath
  - D. Dressing, upper body
  - E. Dressing, lower body
  - F. Lower toilet
- Sphincter
  - G. Bladder
  - H. Bowel
- Transfer
  - I. Bed, chair
  - J. Toilet
  - K. Shower, bath
- Locomotion
  - L. Walk, wheelchair
  - M. Stairs

Social and cognitive items
- N. Comprehension
- O. Expression
- P. Social interaction
- Q. Problem solving
- R. Memory

The personal measure values from the Rasch analyses for admission and discharges were treated for group and individual comparisons. As demonstrated in Figs. 5 and 6 and shown in Table IV, there were rather high correlations between admission and discharge values, indicating the high predictive power of admission FIM values. The predictive power is even higher for a specific diagnostic group such as stroke patients than for the total sample. Adding time since onset of the disease, length of stay in the rehabilitation ward, age and sex only helped to explain the variation in discharge FIM measure values slightly if at all. Somewhat higher explanatory power was reached for the social and cognitive items than for the physical items, which should be compared with the lower number of patients with changes in FIM measures for the former items as seen in Fig. 6. Transformation to linear measure values with Rasch analysis gave

Table III. *Mean FIM scores at admission and discharge for groups of items in the different diagnostic groups (group 1 = stroke, 2 = traumatic brain injury, 3 = other brain injuries, 4 = other neurological diseases, 5 = other diagnoses)*

		1	2	3	4	5	Total
Number		101	50	58	43	15	267
Self care (A–F)	Adm.	4.8	5.5	5.8	5.3	6.1	5.3
	Dis.	5.9	6.3	6.6	6.1	6.6	6.2
Sphincter (G;H)	Adm.	5.7	6.2	6.4	5.8	6.9	6.0
	Dis.	6.3	6.5	6.7	6.1	6.9	6.5
Transfer (I–K)	Adm.	4.6	5.8	6.2	5.0	6.1	5.3
	Dis.	6.0	6.5	6.7	5.9	6.6	6.3
Locomotion (L;M)	Adm.	4.0	4.8	5.5	3.4	3.8	4.3
	Dis.	5.4	6.2	6.3	4.9	5.5	5.7
Communication (N;O)	Adm.	5.0	4.5	5.4	6.3	6.6	5.3
	Dis.	5.6	5.5	6.1	6.4	6.7	5.9
Soc. interact., probl. solv., memory (P;R)	Adm.	5.0	4.0	5.0	5.9	6.1	5.0
	Dis.	5.6	5.0	5.8	6.0	6.0	5.6
Total physical (A–M)	Adm.	62.0	72.3	76.8	65.2	76.7	68.4
	Dis.	77.0	83.2	85.5	75.9	84.0	80.2
Total soc.-cogn. (N–R)	Adm.	25.1	21.0	25.9	30.4	31.4	25.7
	Dis.	27.9	25.9	29.1	30.9	31.4	28.5

higher correlation coefficients than using the sum of the FIM raw scores.

There were significant increases from admission to discharge in all groups, except for the raw scores for social-cognitive items in the neurological patients without brain injury. On an individual basis, the percentage with significant improvement ($p < 0.05$) varied somewhat between the groups, demonstrating again that patient groups already with high FIM values at admission could obviously not improve much. More patients showed significant improvement in physical (Fig. 5) than in social-cognitive items (Fig. 6), the percentages for physical items being 53, 45, 40, 33 and 35 for stroke with right-sided hemiplegia, stroke with left-sided hemiplegia, traumatic brain injury, other brain injury and other neurological diagnoses, respectively. For social and cognitive items the percentages were 17, 21, 30, 26 and 7 for stroke with and without aphasia, and corresponding non-stroke diagnostic groups. Only three patients showed significant reductions in FIM values during the rehabilitation period, one with regard to physical items, two in regard to social and cognitive items.

Besides being able to predict discharge FIM scores from admission FIM, it is of great interest to be able to explain the length of stay from available variables. Multiple regression analyses were performed using raw scores and Rasch measures at admission and changes from admission to discharge, and also with logarithmic values for length of stay. The analyses were not performed in all diagnostic groups because of insufficient material. They were performed only in stroke patients and the total sample, and joint calibration for all diagnosis groups had to be used. As already shown in Table I, the standard deviations for length of stay (LOS) were large, and no marked reduction could be expected. However, it was possible to reach quite a high explanatory power of LOS, as seen in Table V, still with large residual standard deviations. The highest power to explain the variations in LOS, up to around 50%, was found in stroke patients treated separately. Similarly high values could also be reached when only using data from one hospital (not shown in the Table), indicating the importance of having as homogeneous sample as possible for such predictions. Age and sex were included in the analysis, but did not influence the results significantly in any of the models. It also appears that LOS can be explained nearly as well by the admission FIM values alone as by the addition of changes in FIM during the rehabilitation period, as there is a high correlation between admission and discharge FIM (see Table IV). It is also of interest

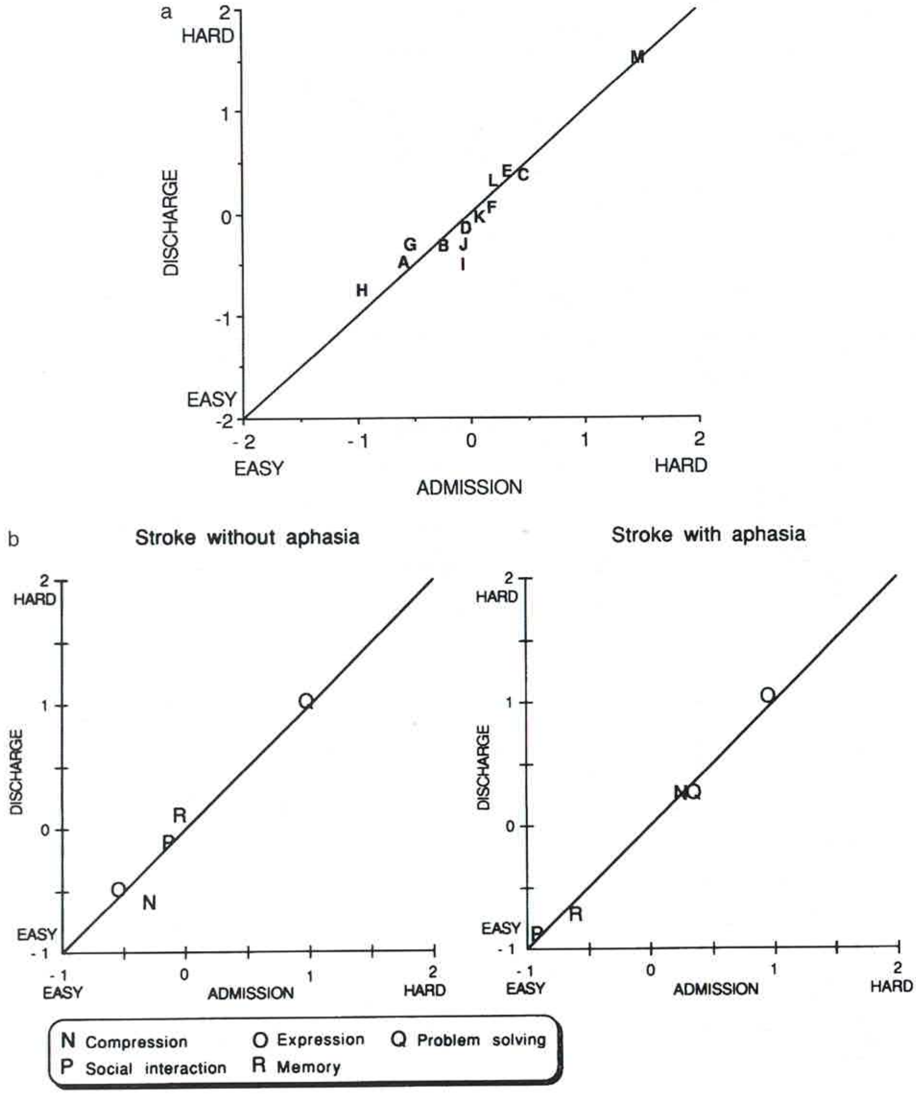

Fig. 4. Item logits from Rasch analysis at admission and discharge for physical (*a*) and social-cognitive items in stroke patients (*b*) with and without aphasia. The line of identity is shown. For explanation of letter symbols see Table II. For L the most commonly used of walk or wheelchair at discharge was used both at admission and discharge. The center of the Rasch scale is set to 0.

to note that the social and cognitive items did not add much to the explanatory power in the models used, nor did the use of the total sum of FIM scores (physical and social-cognitive items together).

DISCUSSION

The Functional Independence Measure has been widely spread, not only in USA with the large data base in Buffalo (UDS) and yearly reports (6, 8, 10), but also around the world and translated into a large number of languages. The present report, the first on its use in Sweden, demonstrates similar item characteristics to those reported by Heinemann et al. (16), Granger et al. (9) and Linacre et al. (18), both concerning comparison between admission and discharge and for the various diagnostic groups. Some moderate differences were, however, noted, as bowel, transfer to bath, and social interaction, which were easier items in the Swedish group, whereas feeding,

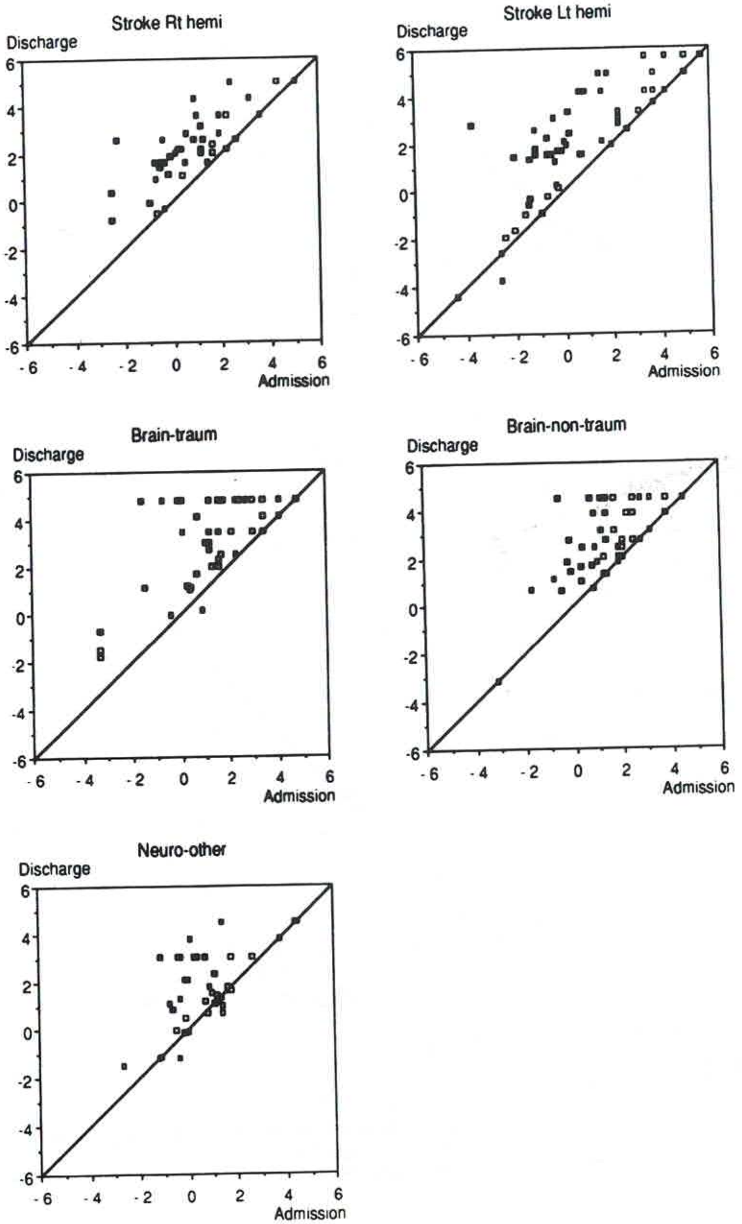

Fig. 5. Admission and discharge measure values in logits for physical items in the different diagnostic groups for first admission patients. Stroke patients are divided into those with right-sided and left-sided hemiplegia. Patients with significant change from admission to discharge are indicated with filled symbols. The line of identity is shown. The center of the Rasch scale is set to 0.

grooming, and dressing the upper body were more difficult. The reason for this could be differences in case mix, but also environmental factors (taking showers being more commonly or exclusively used in Sweden) and attitudes may play a role. Anyhow, the discrepancies are not so large as to make cross-country comparisons difficult. It should also be noted that the average age is considerably lower in the rehabilitation departments in Sweden than in USA (6, 8, 10), as elderly patients in Sweden are referred to geriatric medicine departments for their rehabilitation. It will be interesting to compare item characteristics in different age groups of stroke patients, as FIM has now been introduced in geriatric rehabilitation in Sweden.

Swedish rehabilitation patients are recorded in the present study have a rather high functioning level at admission and are also admitted somewhat later compared with USA patients; for example, stroke patients in the US are admitted on average 20 days

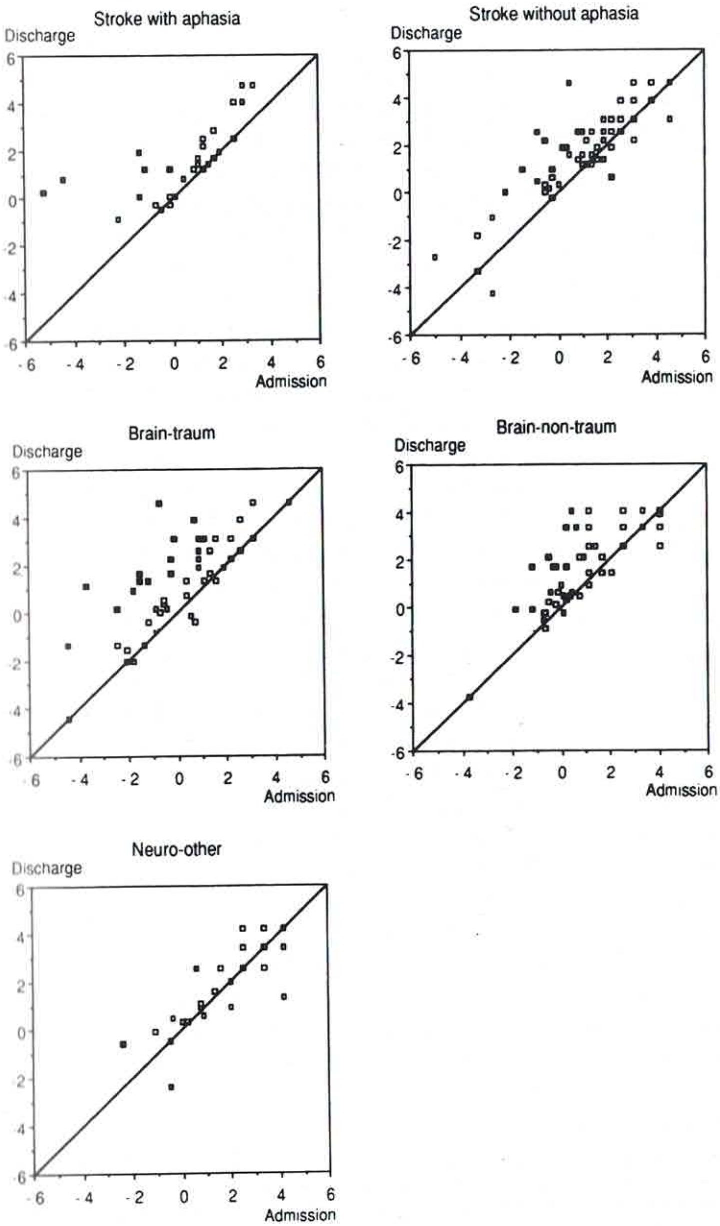

Fig. 6. Admission and discharge measure values in logits for social-cognitive items in the different diagnostic groups for first admission patients. Stroke patients with and without aphasia are shown separately. Patients with significant change from admission to discharge are indicated with filled symbols. The line of identity is shown. The center of the Rasch scale is set to 0.

after onset (10, 14) compared with after 31 days (median value in Sweden) (mean value in 55 days due to skewed distribution). The discharge FIM scores in USA are in fact near the admission scores in the present Swedish material. This will also explain the relatively small FIM gain in the Swedish material, (12) as the largest FIM increase during a rehabilitation stay in stroke patients has been recorded in those with a total FIM score at admission of between 36 and 96 (19). In the present stroke group, it was on average 88 (SD 30). The approach used by us, not to rate as early as after 72 hours (13), but from the observations during the first week of stay, would probably not have had any major impact on the results as the patient regains his/her ability relatively slowly later in the recovery after stroke (14).

By using Rasch analysis, we were able to obtain individual values for physical and social-cognitive

Table IV. *Prediction of discharge FIM for physical (item A–M) and social and cognitive items (item N–R) separately*

Multiple regression analyses were performed in the total sample and in first-admission stroke patients. r^2 values for stepwise entering of independent variables are shown. Admission raw scores and Rasch measure in logits, time from onset of the disease to admission to rehabilitation, length of stay in rehabilitation ward (LOS), age and sex were used as independent variables.

	Raw score	Rasch measure
Physical items		
Total sample		
phys. items adm. +	0.44	0.51
LOS+	0.47	
time since onset +	0.49	0.49
age		0.55
Stroke		
phys. item adm. +	0.53	0.70
LOS	0.57	
Social-cognitive items		
Total sample		
soc.-cogn. item adm+	0.57	0.68
sex	0.58	0.69
Stroke		
soc.-cogn. item adm.	0.58	0.77

items on a linear scale. It was confirmed that item calibration was stable between admission and discharge values, as shown by Linacre et al. (18), and also acceptably stable among the three participating rehabilitation departments, indicating similar usage of FIM ratings and justifying to treat them as one unit. We would like to stress the importance of separating the treatment of social and cognitive items for aphasic and non-aphasic patients, which has not been described earlier. Individual statistics were used to test the level of significance for the FIM change from admission to discharge. Around or somewhat below half of the patients showed a significant increase in FIM measures for the physical items, the largest number of significant improvement being found among stroke patients, slightly larger for right-sided than for left-sided hemiplegics. However, fewer patients showed significant improvement in the social and cognitive items, the best results being found in the group with traumatic brain injuries. Among patients without brain injury there were very few improvements. This was as expected, as reduced social and cognitive ability was most likely not directly related to their current disease. The error values were also relatively large for the measures of social and cognitive ability, as they were only based on calibrations using five items and there were larger variations between diagnoses (16). With larger total samples, more reliable calibrations might be obtained in larger homogeneous subgroups, and statistical improvements predicted with higher accuracy. Failure to achieve significant improvement should, therefore, not be taken as a failure to rehabilitate the patient during his/her stay in the hospital rehabilitation ward. Nevertheless, this approach opens the possibility of using the data in a diagnostic manner to question the lack of improvement in certain patients and to analyse unexpected deviations in FIM item changes.

The use of our data to explain length of stay should be looked upon as a preliminary trial, as the sample for that purpose is rather small and heterogeneous. If such an analysis were to be performed in homogeneous subgroups, still better prediction and lower

Table V. *Prediction of length of stay (LOS) in days and log (days)*

Multiple regression analyses were performed in the total sample and in stroke patients with first admissions and discharge to the community. r^2-values for stepwise entering of independent variables and residual standard deviations (RSD) are shown. Admission raw scores, or measures in logits, changes during rehabilitation, age and sex were used as independent variables.

	Days				Log (days)	
	Raw score		Rasch measure		Raw score	Rasch measure
	r^2	RSD	r^2	RSD	r^2	r^2
Total sample						
phys. items adm. +	0.39		0.33		0.34	0.34
phys. item change adm.-dis.+	0.42				0.38	
soc.-cogn. items adm.	0.44	44	0.37	46	0.40	0.39
Stroke						
phys. items adm.+	0.49		0.41	48	0.48	0.56
phys. item change adm.-dis.	0.53	44			0.52	

residual standard deviations would be obtained. Yet, the present results are promising as a comparatively high explanatory power of admission FIM values could be obtained, e.g. in the stroke patients. This may be compared with average values reported from similar analyses in total patient populations at rehabilitation departments of not more than about 30% (17, 21) and also found in our total sample. Our results also confirm that physical items at admission dominate the prediction compared with social and cognitive items. Admission and discharge FIM are highly correlated, which can be of practical use in the clinical application of FIM ratings in order to monitor FIM changes recorded on different occasions during a rehabilitation stay. The length of stay at the rehabilitation ward had little influence on the prediction of FIM values at discharge, reflecting the correlation between LOS and admission FIM. In a recently published paper by Stinemann et al. (21), models for prediction of length of stay in specific diagnostic groups (Functional Related Groups, FRG) and based on single FIM items gave almost the same predictive power as total raw score values. Theoretically, this approach avoids adding scores from an ordinal scale, as well as being practically attractive, especially as the number of explanatory items can be kept low. Further studies are needed also to identify single items which are most crucial to predict improvement. In the present study we did not intend to perform a follow-up study after discharge, but such a study must also start with a comparison of the stability of the instrument in different living situations and for other procedures.

Our results support the robustness of FIM as an outcome measurement instrument and confirm that it can be used for comparisons of different rehabilitation units. There is, however, a dimensional weakness in the social and cognitive part of the instrument, and only five items are used. Nevertheless, as shown by Linacre et al. (18), these should still be kept separate from the physical items. For clinical use, two ways are at present to be recommended; 1. to use the sum of FIM raw scores separately for physical and social-cognitive items, being well aware of the problem in summing scores from ordinal scales, or 2. to use a Rasch-transformation of the raw scores to linear measures as exemplified in Figs. 5 and 6. For routine purposes this can be made with standardized calibration and will also allow identification of misfit items (unexpected scores) in individual patients, which could be diagnostic. The theoretical background for allowing comparisons of admission and discharge FIM values is good. Further development of the diagnostic use may be possible, for instance, analysis of rehabilitation failure. FIM is, however, limited to some aspects of the disability area, although these are of fundamental importance specially in the early phase of rehabilitation. A more comprehensive approach to outcome evaluation in rehabilitation should be added, so that other aspects than those covered by FIM can be taken into account (2). We would also like to emphasize the importance of adding measurements of psychological, social and vocational factors, and assessments of life satisfaction.

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