

RESEARCH

## FIM-score predictors of discharge destination in older patients admitted for inpatient rehabilitation

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### ABSTRACT

**Objectives:** To determine which dimensions of functional independence measure (FIM) scores or patient characteristics were associated with the possibilities of returning home or being admitted to a nursing home.

**Design:** Retrospective study of admissions and discharges by FIM score.

**Setting:** Clinic for acute geriatrics and rehabilitation at public hospital.

**Participants:** 1727 patients of rehabilitation and acute geriatric treatment over a period of 6.5 years.

**Measurement:** Functional independence measurement (total FIM and FIM sub-scores), age, marital status.

**Results:** 1118 women (64.8%) and 608 men (35.2%) took part in the study. 80% were discharged home. Patients discharged home were younger than those discharged to an institution ( $77.8 \pm 9.9$  (SD) /  $83.4 \pm 7.9$  ( $p < 0.01$ )). Total FIM score on admission was  $89.9 \pm 21.0$  versus  $68.8 \pm 23.1$ , respectively. ( $p < 0.01$ ). Significant contributing FIM score dimensions were  $62.9 \pm 16.9$  versus  $47.5 \pm 17.8$  for motor function ( $p < 0.01$ ) and  $27.1 \pm 6.67$  versus  $21.3 \pm 7.4$  for cognitive function ( $p < 0.01$ ). Marital status on admission had significant influence on total ( $p = 0.00$ ), motor ( $p = 0.00$ ) and cognitive FIM ( $p = 0.02$ ) scores. In patients living alone those who were divorced showed the highest FIM scores for motor and cognitive FIM.

**Conclusion:** Generally, total FIM scores on admission discriminated best between being discharged to a nursing home or to the community. Other factors were motor FIM score, the motor FIM subscore for intimate hygiene, and the cognitive FIM score. *Tasman Medical Journal 2020; 2: 68-73.*

### Introduction

When admitted to a hospital due to an acute illness, elderly patients who are at greater risk of multimorbidity may lose essential skills to undertake the activities of daily living (ADL) and therefore their independence,<sup>1,2</sup> not only due to the acute illness that led to the admission but also due to the lack of individual therapeutic management.<sup>3</sup> Covinsky *et al*

demonstrated that up to 50% of patients older than 85, had a lower function in the ADL after hospital admission than before the acute illness.<sup>1</sup> In consequence these patients potentially cannot return to their home, and are likely to be institutionalized.

Hospital care settings should be aware of the risk of additional loss of independence that patients may

endure during their hospital stay.<sup>3</sup> Special geriatric knowledge and a multidisciplinary team approach to maintain the functional status of the patients during their hospital stay are some of the factors that might prevent irreversible decline of function in the ADL. These patients often need rehabilitation after an acute illness, injury or surgery to regain their functional autonomy.

The study had two aims:

1. To identify if other patient characteristics such as being married (as proxy for living with someone), gender and age, influence the prediction for the discharge location by the Functional Independence Measure (FIM) score.
2. To validate the clinical observation that some specific FIM items seems particularly important in predicting discharge to home.

### Methods

Our rehabilitation facility is part of the public hospital (HFR) in the canton of Fribourg (population 318,000) Switzerland. All patients admitted to the facility from August 2005 to December 2012 for 7 or more days and discharged to home or an aged-care facility were included.

Exclusion criteria were death during admission, discharge to any acute hospital (somatic, psychiatric, and geriatric) or other rehabilitation facility and unknown discharge location.

Demographic data was retrieved from the hospital administrative database (OPALE). Age, gender, marital status, length of stay, discharge location, FIM scores on admission and discharge were collected. Incomplete data sets were excluded from the statistical analysis. The study data was anonymized by the principal investigator before being sent for statistical analysis.

All patients received a multidimensional assessment on the basis of the bio-psycho-social model. Medical conditions and medications were reviewed and all received physio- and occupational therapy adjusted to individual functional and cognitive disabilities and personal goals. Depending on need patients also received speech therapy, nutritional counseling and neuropsychological evaluation. Our social services help with the discharge planning and organize any additional assistive equipment needed.

A first FIM evaluation was undertaken within 72 hours of admission. Treatment goals are defined discharge planning is started with patient involvement. The FIM® instrument consists of 18 items; 13 for motor and 5 for

cognitive function. The scores range from 1 (total dependence) to 7 (complete independency) per item, thus the score ranges from 18 to 126 points. A minimum of functional autonomy is required for a patient to be able to return to his home. A patient living alone, requires higher motor and cognitive skills than a person living with a spouse or other carer.

In order to enable the patient to participate and undertake activities of his/her choice, specific goals to achieve during rehabilitation were established. For a person not living alone, a score for the above activities of above 3 (needing some physical support) can be sufficient for home discharge. Significantly lower scores in the cognitive functions can be tolerated as well, as a caregiver is present. That person can also assist with other activities of daily living, which are therefore not vital.

The achievement of these goals and measurement of functional status were assessed weekly and discussed during an interdisciplinary meeting and adjusted as required. Furthermore at least one meeting with the family and other persons involved in the care of the patient after rehabilitation was organized to discuss discharge dispositions. When necessary, the occupational therapists undertake a home evaluation to assess the need for adjustments to be made in the home environment, for higher safety.

The FIM score was re-evaluated 72h before discharge and all essential external help was organized. Social workers assisted the patient and his family with administrative work required for discharge, such as registration for admission to nursing home.

Approval from the Swiss ethical committee in Lausanne was granted on the 13<sup>th</sup> October 2014.

### Statistics

Statistical analyses were performed using SPSS V20 (IBM) was used. Logistic regression was used to assess the influence of each FIM sub-score as well as age, sex and marital status on the probability of being discharged home or to an institution. Each of the FIM scores was expressed as standard deviation (SD) units in order to allow comparison of odds ratios between different parameters. Age was expressed in decades. Both univariate and multivariate analyses were conducted. Univariate analyses contained only a specified variable, while multivariate analyses included all variables including interest, age, sex and marital status. The interaction between marital status and other variables was also tested as this was hypothesized to be a moderating factor. The reported odds ratios for all FIM scores are for a one SD change in the FIM score.

## Results

A total of 2585 patients were admitted to the rehabilitation facility during the study. After application of exclusion criteria, 2218 were enrolled into the study. Complete information was available for 1727 patients. Of these, 1386 (80.3%) returned home and 341 (19.7%) were discharged to a nursing home or similar institution. The final study sample comprised 1118 women (64.8%) and 608 men (35.2%). The mean age of patients discharged home was 77.8± 9.9 (SD) and 83.4± 7.86 years for those discharged to an institution.

	Commune (n=1386)	Institution (n=341)	P
<b>Age</b>	77.8±10.0	83.4±7.9	<0.01
<b>% female</b>	63%	71%	<0.01
<b>Admission FIM score</b>	89.9±21.0	68.8±23.1	<0.01
<b>Days in rehabilitation</b>	19 (13–26)	22 (14–31)	<0.001
<b>Motor FIM score on admission</b>	63.0±17.0	47.5±17.8	<0.01
Eating/drinking	7	6	<0.01
Intimate hygiene	6	4	<0.01
Bladder management	6	4	<0.01
Bowel management	6	5	<0.01
Bed/stool/wheelchair transfer	5	4	<0.01
<b>Cognitive FIM score on admission</b>	27.1±6.7	21.3±7.4	<0.01
Acoustic/visual understanding	6	5	<0.01
Verbal/nonverbal expression	6	5	<0.01
Social behavior	6	5	<0.01
Problem solving	6	5	<0.01

Table 1. Demographics, baseline and discharge characteristics of the study population. Values are expressed in n (%) for categorical variables and means ± standard deviations (SD) for age, total, motor, cognitive FIM scores and time in rehabilitation and median for subscores. P values for age, total, motor, cognitive FIM scores, subscores and time in rehabilitation are from t-tests. “Commune” = Community

Patients admitted to our rehabilitation facility have a variety of indications and their mean age ranges from 67-90 (mean age of 79) with slightly more women than men (approx. 63% vs. 47%). More than 80% of the study population was discharged home after an average length of stay (LOS) in rehabilitation of 22 days (interquartile range = 14 – 27 days). Patients discharged home were younger (77.7 vs 83.3), mostly female (63%) and living alone. Table 1 shows the demographic data, baseline and discharge characteristics. The unadjusted OR and p values showed a significant influence for gender.

Those discharged to nursing homes vs home tended to stay 3 days longer in rehabilitation (25 vs 22 days) and

had lower FIM scores at both admission and discharge. They also had a smaller increase in total and motor FIM scores during their stay, but the change in cognitive scores or its sub-scores was not significantly different (table 2).

Measure	Community	Institution	P
Total FIM	11.33±12.40	8.22±13.12	<0.01
Motor FIM	9.73±10.42	6.66±11.09	<0.01
Cognitive FIM	1.54±3.85	1.55±3.89	NS

Table 2. Changes in FIM scores during rehabilitation.

Table 3 shows the results from the univariate (age, marital status, gender, FIM Scores) and multivariate (FIM sub-scores) analyses of risk factors measured at admission. Older age reduced the odds of being discharged home. The data confirmed that autonomy in eating/drinking, intimate hygiene and being able to transfer independently are significant motor skills for discharge home. Analyses adjusted for age, gender and marital status showed congruent patterns to the unadjusted analyses, although the beneficial effect of female gender on discharge home was no longer significant.

	OR	P	Type
<b>Age</b>	0.92	< 0.01	
<b>Marital status</b>	0.84	< 0.01	
<b>Female</b>	0.75	0.029	UA
<b>Total FIM score at admission</b>	1.04	< 0.01	
<b>Motor FIM score at admission</b>	1.04	< 0.01	
eating/drinking	1.49	< 0.01	
intimate hygiene	1.47	< 0.01	
bladder management	1.36	< 0.01	MA
bowel management	1.40	< 0.01	
bed/stool/wheelchair transfer	1.40	< 0.01	
<b>Cognitive FIM score at admission</b>	1.11	< 0.01	UA
acoustic/visual understanding	1.35	< 0.01	
verbal/nonverbal expression	1.34	< 0.01	MA
social behavior	1.38	< 0.01	
problem solving	1.21	< 0.01	

Table 3. Effects of baseline characteristics on discharge location. Odds ratios (OR) > 1 represent increased probability of discharge home. For FIM scores, the effect is expressed for a one standard deviation increase in the variable, for age per decade. P values are from two-sided. UA = Univariate analysis; MA = multivariate analysis

The discriminative ability of the change in FIM scores was low compared to absolute admission or discharge values. Acoustic/visual understanding and social behavior, closely followed by expression (verbal/nonverbal) were most significant cognitive function sub-scores for discharge home.

FIM scores at admission were higher (p=0.039) for patients living alone (n=1040; 86.7±21.9) versus

currently married patients (n=686; 84.4±24.5). Table 4 shows for patients living alone that divorced patients exhibited significantly higher total FIM scores and greater functionality than either singles or widowed patients.

	Divorced	Single	Widowed	P
N	102	166	772	
Total FIM	96.4±18.1	87.3±22.1	85.3±22.1	<0.001
Motor FIM	68.7±15.0	60.7±17.6	59.5±17.5	<0.001
Cognitive FIM	27.7±6.2	26.6±7.1	25.8±7.1	0.024

Table 4. FIM scores in relation to previous marital status in patients living alone.

## DISCUSSION

C V Granger and his co-workers, in a joint task force appointed by the American Academy of Physical Medicine and Rehabilitation and the American Congress of Rehabilitation Medicine, created a uniform data set for measuring disability and rehabilitations outcomes in 1983. As a result the Uniform Data System for Medical Rehabilitation (UDSMR) was created. The UB (University at Buffalo South) received a three-year grant in 1984 from the National Institute for Disability and Rehabilitation Research to develop such a standard. The UDSMR, the FIM instrument and UDSMR data-management service are the result.<sup>4</sup>Fifteen years after Faculty members in the UB Department of Rehabilitation Medicine created the FIM instrument, they were involved with the federal Health Care Financing Administration (HCFA) in developing an instrument to be used by rehabilitation hospitals and other rehabilitation units as the basis for Medicare prospective payment in 1998.

The FIM score has since become the most frequently used assessment tool in the USA<sup>5</sup> and has become a means of estimating payment to inpatient rehabilitation facilities by insurance companies. Several studies have demonstrated a relation between FIM discharge scores and discharge location.<sup>5-7</sup> Most are based on a specific sub-population of patients – for example, those with stroke<sup>5,6</sup> or hip fractures.<sup>8</sup> This study was in an unselected sample of elderly patients in the rehabilitation facility and thus may have wider application.

Reistetter *et al* found a cut-off value for total FIM score of 78, above which a patient could return home,<sup>6</sup> whereas the review by Bottemiller *et al* cited several articles suggesting that FIM score on discharge >80 gave a 90% chance of returning home, compared to

scores < 40 where the corresponding chance was only 30%. It remained unclear what happens to those with an intermediate score.

Most studies have been conducted on selected patient populations<sup>8-13</sup> Seematter *et al* examined a more heterogeneous patient sample, but employed the Barthel Index.<sup>14</sup> Other studies have included heterogeneous patient populations<sup>15-17</sup> but to our knowledge this is the first study in an unselected patient population to evaluate the utility of the FIM Instrument in the discharge planning of a broad selection of patients.

Several studies<sup>13,15-17</sup> aimed to identify predictors for the discharge location. Although most found that motor<sup>13,16,17</sup> and cognitive<sup>13,17</sup> skills were important predictors, Astell *et al* found that independence for ADL was the key predictor.<sup>15</sup> This is consistent with our findings for the specific FIM motor subscore, similarly established by Jackson *et al* who identified 3 physical performance items (grooming, toileting and chair transfers) as well as 4 cognitive performance items (comprehension, expression, problem solving and memory) as predictors.<sup>17</sup> Shashi *et al* were also able to identify predictors similar to ours: age, gender, cognitive and motor skills,<sup>13</sup> but others found age to be a weak predictor.<sup>15,17</sup>

This study finds that the change of the total and motor FIM scores in both groups were significantly higher for the patients able to return home in our study. Of the selected motor sub-scores, only the item for intimate hygiene changed significantly during rehabilitation, thus validating our clinical observation that this seems to be a key component for returning home.

Patients with FIM scores <5 for items such as grooming, bathing, dressing and locomotion are still able to return home, even if they live alone, as long as they are independent (FIM ≥6 for each) in motor and cognitive sub-scores such as eating/drinking, intimate hygiene, bladder and bowel management, bed/stool/wheelchair/toilet transfer, acoustic/visual understanding, verbal/nonverbal expression, social behavior, and problem solving.

Although age might be expected to have an influence on discharge accommodation, it was not an independent risk factor in this study. Our interpretation is that age has less of an influence on patient functionality than multimorbidity. Whether the underlying medical condition is a significant predictor of discharge destination is uncertain.<sup>13,17</sup> Another observation, again not unexpected and found by others,<sup>17</sup> was that patients discharged to an institution had longer length of stay. We interpret this finding as a consequence of our early

discharge planning. If the general disposition of a patient is weak and discharge to home is therefore uncertain, we plan for both outcomes very early on during the rehabilitation and organize applications for the entry into a nursing home with the patient and the family. Sometimes these patients will remain in rehabilitation for longer periods of time in the hope that an entry into a nursing home can be prevented.

A previous study<sup>6</sup> found that a cut-off value of  $\geq 78$  (total FIM score) satisfactorily predicted the location of discharge. This score correctly classified more than 75% of patients discharged to the community and institutional settings (FIM score  $\leq 78$ ) respectively. In our sample this value provides good sensitivity (74.4%), but poor specificity (37.0%). Yet it correctly determined the discharge location of 80.2% of patients. Hence approximately 20% of patients with a total FIM score  $< 78$  were discharged home, or discharged to an institution with a score  $> 78$ . This shows that in practice the total FIM score is not a reliable predictor of discharge destination. In our experience the destination is determined by extensive discharge planning according to the goal settings defined by the International Classification of Functioning, Disability and Health within the patient's individual resources, context factors and the individual FIM scores, especially the sub-scores for intimate hygiene, bladder and bowel management. The fact that divorced patients showed highest FIM may reflect a strong resolve by these patients to be autonomous.

### Limitations

A limitation of the study is that the use of marital status as a proxy for living with someone may lead to some misclassifications - some married patients may live alone for some reason, while some unmarried, divorced or widowed patients may live with a caregiver e.g. children, or other partner. This information is not gathered in our hospital administrative database.

In addition, the exclusion of a third of all patients presenting to our service due to defined criteria and incomplete data sets may have produced a study group with unexpectedly good functionality as seen with the high admission FIM grade.

### Conclusion

In this study, age was positively related to institutional discharge. All FIM scores – total, motor and cognitive, were positively related to the probability of discharge home. Generally, total FIM scores discriminated best between patients discharged to a nursing home or their own home but that score alone is not able to predict accurately discharge location. Discharge planning is an essential part of the rehabilitation process, influenced by several context factors and resources inherent to the

patient and his surroundings. Nevertheless, the practical use of the FIM score requires further study.

**Provenance:** Externally reviewed.

**Ethics:** Approval received from the Swiss Ethics Committee, Lausanne.

**Disclosures:** No disclosures.

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