JGG 2016;64:41-48

ORIGINAL INVESTIGATION

Predictors for a good recovery after subacute geriatric care

J. Foss Abrahamsen[1], S. Boffelli[2], R. Rozzini[3], A. Cassinadri[2], A.H. Ranhoff[1], M. Trabucchi[4]

[1] Kavli Research Centre for Geriatrics and Dementia, Haraldsplass Deaconess Hospital, Bergen, Norway; [2] Sub Acute Care Unit, Fondazione Ospedale Poliambulanza, Brescia and Italian Research Group, Brescia, Italy; [3] Geriatric Department, Fondazione Ospedale Poliambulanza, Brescia and Italian Research Group, Brescia, Italy; [4] Department of Neuropsycopharmacology, University of Rome II, and Geriatric Research Group

Background and aims. We wanted to investigate eight different geriatric assessment tests regarding the prediction of 1) a good recovery (ability to return to own home or transfer to further rehabilitation), and 2) a poor recovery (discharge to nursing home, hospice, acute hospitals or death) in elderly patients treated in a subacute geriatric hospital ward.

Methods. Consecutive 664 community-dwelling patients aged ≥ 70 years, transferred from acute medical and geriatric wards to a subacute geriatric ward were included. Demographic data and eight different geriatric assessment tests were recorded, and odds ratio for having a good versus poor recovery was assessed with logistic regression analysis.

Results. Improvement in Barthel index (OR = 6.77, 95% CI 3.41-13.45, $p < 0.001$) and the Tinetti scale (OR 4.58, 95% CI 2.36-8.89, $p < 0.001$), along with the absence of symptoms of depression (OR = 2.19, 95% CI 1.04-4.59, $p = 0.04$) and cognitive impairment (OR = 2.19, 95%CI 1.10-4.30, $p = 0.02$), were significantly associated with a good *versus* bad recovery in logistic multivariate regression analysis. Significant collinearity ($R > 0.75$, $p < 0.001$) was demonstrated between several of the functional assessment tests.

Conclusions. Functional assessments with Barthel index at admission to the subacute ward and one day before discharge, as well as evaluation with MMSE and GDS once during the stay in the subacute ward, gave the optimal prediction of short term recovery. Further assessment with other overlapping functional tests may be redundant.

Key words: Subacute care, Older patients, Rehabilitation, Recovery, Depression

INTRODUCTION

Hospitalization in older patients is associated with functional decline and increasing dependency [1-3]. Some patients are not able to return directly to their own home and need further care to regain their functional capacity. Subacute care focuses on specialized inpatient multidisciplinary geriatric treatment and rehabilitation as a complement to acute and curative medicine [4 5]. In 2011 a 19-bed Italian subacute care ward was established as part of the geriatric department at the Fondazione Ospedale Poliambulanza in Brescia, Northern Italy, to offer multidisciplinary geriatric based treatment for patients that started medical treatment in an acute hospital ward, but have not yet recovered to the extent that is possible to discharge the patients to their own home [6]. At the same time, a complete and extensive comprehensive geriatric assessment (CGA) schedule, including eight different geriatric assessment tests, was introduced for patients admitted to all geriatric departments in Northern Italy [7]. Earlier studies on patients admitted to Italian acute and intensive geriatric wards

Received: February 19, 2016 - Accepted: June 18, 2016

Correspondence: Jenny Foss Abrahamsen, Kavli Research Centre for Geriatrics and Dementia, Haraldsplass Deaconess Hospital, Ulriksdal 8, 5009, Bergen, Norway - E-mail: jennyfossabrahamsen@gmail.com

have demonstrated that inability to regain function during hospitalization was associated with higher 3 month mortality [8 9]. Accordingly, the assessment schedule in the subacute ward also included assessments before the acute hospitalization and during the stay in the subacute ward, to be able to follow the trajectory of the potential functional loss in these patients.
In clinical practice it is important to evaluate the cost and benefits of geriatric assessment, given the rather low-predictive power of screening instruments [10]. After three years of extensive CGA of all patients admitted to the subacute care ward, we wanted to assess the usefulness and predictive value of the different assessment tests regarding whether the patients would experience a good versus poor short-term recovery. Special attention was paid to examine the functional trajectories during the stay in the subacute ward. To our knowledge, no such study has been performed on patients treated in a subacute geriatric ward.

METHODS

Design and setting

This study is part of a prospective, observational, cohort study that enrolled 664 homedwelling consecutive patients ≥ 70 years treated during 2011-2014 in the subacute hospital geriatric ward after acute hospitalization. The setting and the patients have been described in detail in a recent paper [11]. The optimal goal of the stay in the subacute unit was that the patients should be able to return to their own home within 40 days.

Patients and inclusion criteria's

In addition to age ≥ 70 years and being home dwelling before the acute hospitalization, the patients should have a rehabilitation potential, be circulatory and respiratory stable and not have a terminal illness. Patients with cognitive impairment were admitted if they had medical needs and the cognitive decline was not the reason for the admittance.
A majority of the patients were admitted from the departments of internal medicine, cardiology, pulmonology, and acute geriatric departments, most of them with cardiovascular diseases or infections. No patients were admitted with fractures, after elective orthopaedic surgery or after a recent stroke.
The different geriatric assessment tests were performed in > 95% of the patients, except GDS, that was performed only in patients without major cognitive impairment and MMSE ≥ 15, (n = 494 (74%), as the GDS questionnaire is regarded unsuitable for patients with major cognitive impairment.

Subdivision of patients into good and bad outcome after subacute care

The patients that were able to return home (n = 420) and patients discharged for further geriatric rehabilitation (n = 85), were defined as having a good recovery. The rest of the patients that needed readmission to an acute hospital ward (n = 41) were discharged to nursing home (n = 58), to hospice (n = 9) or died during the stay in the subacute ward (n = 47), were defined as having a poor outcome.

Geriatric assessment tests

CGA was performed with the following geriatric assessment tests, all performed by the doctor in the subacute ward.
Barthel index sub score (hereafter referred to as BI), was recorded 2 weeks before the acute hospitalization (by asking the patient or their relatives) and at admission to the subacute ward and the day before discharge, by observing the patient. BI is a questionnaire that scores 10 different ADL-items (feeding, bathing, grooming, dressing, defecation, bladder function, ability to use the toilet, transfer, mobility and climbing stairs). The range of scores is 0-100, higher scores indicates better function [12].
The Tinetti scale (Tinetti) was performed at admission and the day before discharge. This test includes assessments of physical ability, mainly of balance and moving. The range of scores is 0-28, higher scores indicates better function [13].
The Blaylock Discharge Planning Risk Assessment Screen (BRASS) includes questions of age, living situation, previous hospital admissions, number of medical problems and drugs, cognition, functional status, behaviour pattern, mobility and sensory deficit. Lower scores indicate better function and scores > 20 may indicate that the patient needs alternative level of care [14].
Scala III A (Index of Intensity of Assistance) is an Italian "ad hoc scale", divided into 12 items, each indicating progressive functional dependence in ADL and need of assistance. The range of scores is from 0-4, higher scores indicate increasing dependence [7].
The Clinical Dementia Rating (CDR) is a five item cognitive rating scale based on interview with the caretakers. The range of scores is from 0 (no dementia) to 5 (severe dementia) [15].
Mini Mental Status Examination (MMSE) is assessing the patients with different questions related to cognition. The range of scores is 0-30, higher scores indicates better function [16]. MMSE was performed at admission and the day before discharge and the best of these values were included in the present analysis.
Geriatric Depression Scale (GDS), a 15 item

questionnaire were performed at admission and the day before discharge, higher values are associated with depression [17]. In the regression analysis, GDS was stratified into two groups, GDS < 6, indicating no geriatric symptoms, and GDS ≥ 6, indicating symptoms of depression. The discharge GDS value, assumed to be the most representative of the patients` mental status, was included in the multivariate analyses.

Cumulative Illness Rating Scale (CIRS) measures 1) comorbidity and 2) disease severity. The range of scores is from 0-5, higher scores indicates higher comorbidity and disease severity, respectively [18].

Statistical analysis

Continuous data with a normal distribution were presented as mean (standard deviation) and compared with Independent-Samples T test. Continuous data with a non-normal distribution were presented as median (min-max) and compared with the Mann-Whitney U test. Categorical data were presented as numbers (percentages) and compared with Chi-Square test. The p-values were two-sided and $p \leq 0.05$ was considered to be statistically significant. Collinearity was assessed with two-sided Pearson correlation test.

For identifying the clinical characteristics that were independently associated with having a good outcome, odds ratios (ORs) with 95% confidence intervals (CIs) were estimated using logistic regression models. The characteristics associated with $p < 0.25$ in univariate analysis were noted as likely predictors and included in multivariate, logistic regression models. In this analysis, $p \leq 0.05$ was considered to be statistically significant.

Only explanatory variables not demonstrating significant collinearity (defined as $R > 0.75$, $p < 0.001$, Table II), were included in the multivariate analysis. Accordingly, only the admission BI and Tinetti scores and not the discharge scores were included in the multivariate model demonstrated in Table III. Since there was a highly significant covariation between the BI and Tinetti assessment tests, each of these variables were tested in two different multivariate models. All the analyses were performed using the Statistical Package for Social Science (IBM SPSS 20), for Windows.

Ethics

All patients gave a written, informed consent for the treatment of personal data at hospital admission and the study was approved by hospital Ethical board. No experimental interventions were performed.

RESULTS

Differences between the trajectories of patients experiencing a good or bad outcome

Table I shows the characteristics of all the patients and patients with a good and bad recovery after acute hospitalization and subacute care. Overall, the patients in the good recovery group had clinical important better scores on nearly all of the geriatric assessment tests.

As shown in Figure 1, the loss in functional status in relation to the acute disease was substantial, with a median, equal reduced BI score of 40 in both groups. The patients in the good outcome group already before hospitalization had a higher BI score than the patients in the bad outcome group, and this difference increased further during subacute care, as more of the patients in the good outcome group experienced functional improvement and increased BI scores, as compared to the patients in the poor outcome group (Fig. 1). As a result of this, more patients with good outcome were able to return to their functional level before the hospitalization (39%), as compared to patients with bad outcome (15%). The same trend of improved functional gain in the good outcome group was seen when the functional trajectory was assessed by the Tinetti (Tab. I).

Covariation between different functional assessment tests

As represented in Table II, significant collinearity was demonstrated between several of the different assessment tests.

Predictors for patients having a good recovery

Table III demonstrates the unadjusted and adjusted OR for the association between different variables and a good outcome. While several of the functional tests were significantly associated with a good recovery in univariate analysis, only improvement in BI or Tinetti, based on assessment performed at admission to the subacute ward and the day before discharge, were associated with a good outcome, in the multivariate analysis shown in Table III. Thus, a BI or Tinetti increase of any value was associated with a 6 and 4 fold increase, respectively, of the patients having a good outcome. In addition, both a GDS score < 6, indicating no depression, and a MMSE score ≥ 24, indicating no cognitive impairment, were associated with a 2-fold increase for the patients to have a good outcome.

Table I. Differences between patients with good and bad outcomes after subacute care.

	N*	All patients	Good outcome	Poor outcome	p-value
	664	664 (100%)	505 (76%)	159 (24%)	
Demographic characteristics					
Live alone	655	212 (32%)	163 (33%)	49 (31%)	0.36
Male sex	664	293 (44%)	216 (43%)	77 (48%)	0.23
Age	664	82 (6)	82 (6)	82 (7)	0.66
Education (years)	657	5 (0-20)	5 (0-20)	5 (0-20)	0.82
Two weeks before admission					
CDR	636	0.53 (0.92)	0.43 (0.80)	0.89 (1.18)	< 0.001
BI pre	657	85 (0-100)	85 (0-100)	70 (0-100)	< 0.001
Assessment during stay in subacute care					
Blaylock scale	655	21 (5)	20 (5)	24 (6)	< 0.001
BI admission	657	40 (0-100)	40 (0-100)	20 (0-100)	< 0.001
BI discharge	648	60 (0-100)	70 (0-100)	20 (0-100)	< 0.001
Tinetti scale admission	658	6 (0-28)	7 (0-28)	1 (0-28)	< 0.001
Tinetti scale discharge	651	18 (0-29)	20 (0-29)	1 (0-28)	< 0.001
Scala III tot	650	2.9 (0.3)	2.9 (0.32)	3.0 (0.28)	0.004
CIRS severita	650	1.8 (0.3)	1.7 (0.3)	1.9 (0.3)	< 0.001
CIRS comorbidity	650	2.5 (1.4)	2.4 (1.3)	3.1 (1.5)	< 0.001
MSSE (best score)	619	25 (0-30)	26 (4-30)	21 (0-30)	<0.001
Cognitive impairment (MMSE < 24)	619	244 (40%)	170 (35%)	74 (59%)	< 0.001
GDS admission	502	4 (0-14)	4 (0-14)	4 (0-14)	0.47
GDS discharge	494	3 (0-15)	2 (0-15)	4 (0-12)	< 0.001
Depressive symptoms (GDS ≥ 6)	494	56 (11%)	38 (9%)	18 (26%)	< 0.001
Delirium at admission (cat)	659	125 (19%)	86 (17%)	39 (25%)	0.002
Change in fictional status					
BI loss at admission[a]	640	40 (0-100)	40 (0-90)	40 (0-90)	0.90
Improved BI score [b] (nom)	649	20 (0-75)	25 (0-75)	0 (0-65)	< 0.001
Improved BI (cat)	649	510 (79%)	449 (90%)	61 (41%)	< 0.001
Improved Tinetti score [b] (nom)	654	8 (0-26)	8 (0-26)	0 (0-24)	< 0.001
Improved Tinetti (cat)	654	506 (77%)	444 (89%)	62 (40%)	< 0.001
Return to pre BI [c] (cat)	640	212 (33%)	192 (39%)	20 (15%)	< 0.001

CDR, Clinical Dementia Rating scale, BI, Barthel index, I-ADL, Instrumental – Activities of Daily, Living, CIRS, Cumulative Illness Rating Scale, MMSE, Mini mental state examination, GDS, geriatric depression scale, (15 item), cat= categorical, nom= nominal

Continuous variables are characterized as mean (standard deviation), median (min-max values), categorical variables as number (%) of patients in each outcome group.

*Number of patients assessed [a]BI score 2 weeks before admission – BI score at admission, [b]Score at discharge – score at admission, [c]Return to same BI score as 2 weeks before hospitalization

Table II. Collinearity between different geriatric assessment tests.

Assessment tests	R-value
BI discharge and Tinetti discharge	0.92
BI admission and Tinetti admission	0.82
Improved* BI and Improved Tinetti	0.77
BI admission and BI discharge	0.78
BI admission and BRASS	0.72
CDR and MMSE	0.79

For description of the assessment test, see the Methods section

*Score at discharge – score at admission

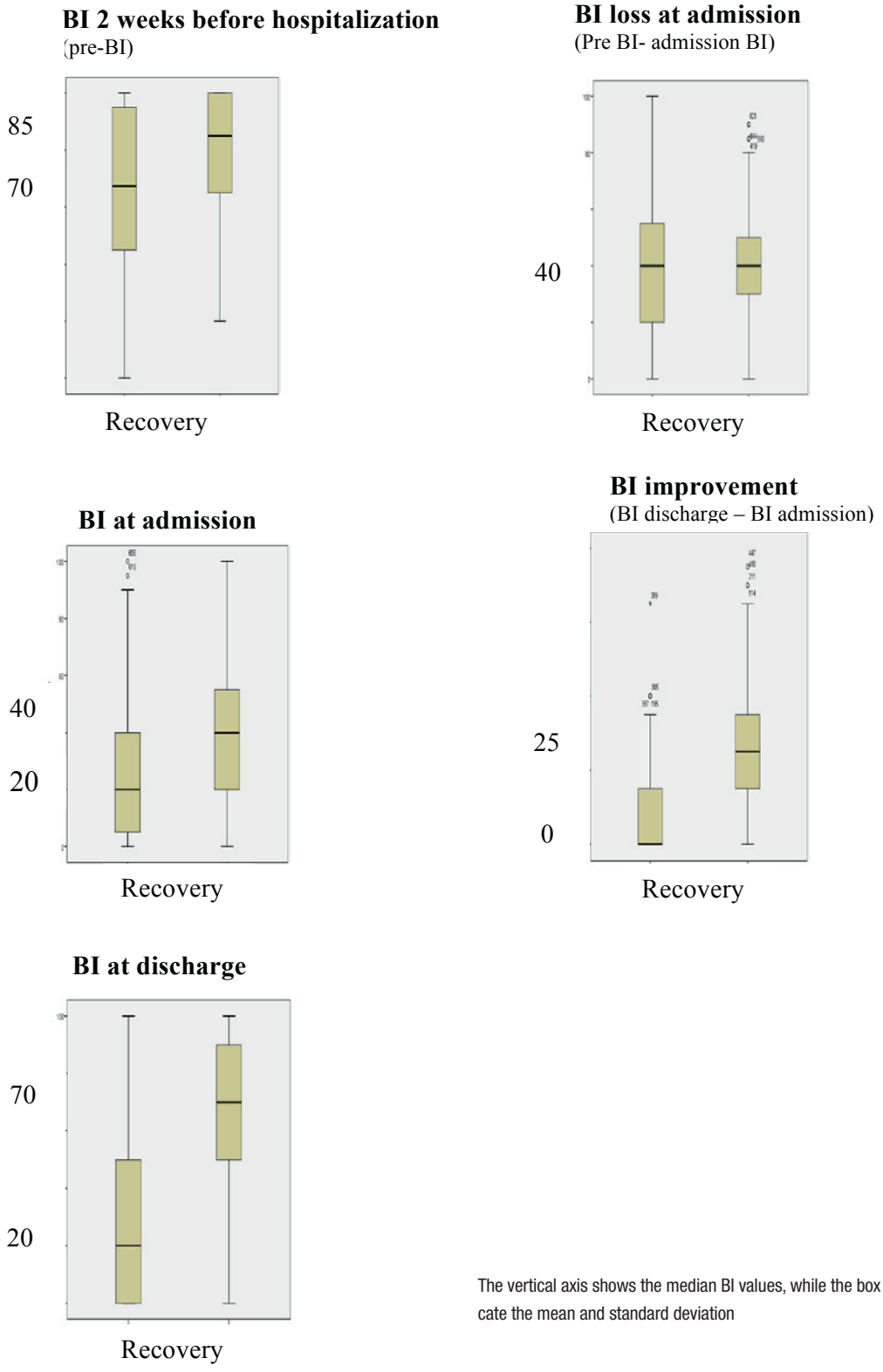

Figure 1. Trajectories of functional status before and during subacute care in patients experiencing a poor (columns to the left) and good (column to the right) recovery.

Table III. Univariate and multivariate regression analysis for predicting a good *versus* bad outcome with two separate multivariate models including either BI sum score or the Tinetti scale.

	Univariate			Multivariate					
				Model 1, Barthel Index			Model 2, Tinetti scale		
	R	95% CI	p	R	95% CI	p	R	95% CI	p
Age	0.99	0.97-1.02	0.67	-			-		
Education	1.01	0.96-1.06	0.67	-			-		
Male sex	0.91	0.83-1.70	0.36	-			-		
Live alone	1.05	0.71-1.56	0.79	-			-		
Geriatric assessment									
BI 2 weeks pre admission	1.03	1.02-1.04	< 0.001	0.99	0.97-1.01	0.17			
BI loss at admission[a §]	1.00	0.99-1.01	0.70	-			-		
BI admission	1.03	1.02-1,04	< 0.001	1.01	0.99-1.03	0.36			
BI discharge[#]	1.04	1.04-1.05	< 0.001						
Any improvement in BI*	12.15	7.82-18.88	< 0.001	**6.77**	**3.41-13.45**	**< 0.001**			
Return to pre BI[b]	3.74	2.25-6.21)	< 0.001	1.77	0.89-3.53	0.10	2.06	1.04-4.11	0.04
Tinetti admission	1.08	1.05-1.11	< 0.001				0.99	0.95-1.04	0.68
Tinetti discharge[#]	1.14	1.11-1.17	< 0.001						
Any improvement in Tinetti*	11.28	7.34-17.34	< 0.001				**4.58**	**2.36-8.89**	**< 0.001**
Blaylock scale[§]	0.88	0.85-0.92	< 0.001	0.98	0.89-1.07	0.66	1.01	0.94-1.10	0.75
Scala III tot[§]	0.35	0.16-0.73	0.005	1.42	0.51-3.92	0.50	1.53	0.57-4.08	0.40
GDS admission < 6	1.19	0.75-1.92)	0.46	-					
GDS discharge < 6	3.52	1.87-6.61)	< 0.001	**2.19**	**1.04-4.59**	**0.04**	**2.43**	**1.20-4.92**	**0.01**
MSSE ≥ 24	1.09	1.06-1.12	< 0.001	**2.19**	**1.10-4.30**	**0.02**	**1.97**	**1.05-3.71**	**0.04**
CIRS severita[§]	0.28	0.16-1.50	< 0.001	1.38	0.33-3.5.81	0.66	1.01	0.26-3.91	0.99
CIRS comorbidity[§]	0.74	0.65-0.85)	< 0.001	0.94	0.71-1.20	0.66	0.96	0.74-1.25	0.75
Delirium at admission	0.62	0.40-0.96	< 0.001	1.80	0.61-5.30	0.19	1.53	0.55-4.27	0.42

OR= odds ratio, CI= confidence interval, BI= Barthel index, CIRS= Cumulative Illness Rating Scale, MMSE= Mini mental state examination,

MMSE > 24 indicates no cognitive impairment, GDS= geriatric depression scale, 15 item, GDS < 6 indicates no depressive symptoms.

[#]not included in multivariate analysis due to collinearity with other variables

[‡]OR were estimated using logistic regression models and adjusted for the covariates as described in the Methods section

[a]BI score 2 weeks before admission – BI score at admission, [b] BI score day before discharge – BI score 2 weeks before hospitalization

[§]Variables are per unit increase, *Score at discharge – score at admission

DISCUSSION

The present study demonstrates that the ability to achieve improvement in functional status during subacute care, the absence of symptoms of depression and absence of cognitive failure were independently associated with a good versus a bad recovery after acute hospitalization and subacute geriatric care. These results are rather encouraging, since both functional loss and depression can be managed by therapy.

Other studies have demonstrated that functional status is related to a good or bad outcome, including mortality, after hospitalization [8 19 20]. The present study indicates that the patients who improved their BI or Tinetti score during the stay in the subacute ward were 7 or 5 times more likely to have a good versus bad recovery. This shows the importance of following the patients' trajectory of functional status during the hospital stay, rather than just measure one single and static measure. This has also been demonstrated in a population of intensive care geriatric patients in our hospital [9]. While the BI pre-admission may give information on the patients` past health status, the admission BI may mirror the impact of the acute disease, and the improvement or lack of improvement in BI during the hospital stay may express the individual response to a disease and its treatment. The measurement of ADL function with BI (or Tinetti) may therefore give information about illness severity beyond that provided by comorbidity and laboratory data [21 22].

The significant covariation between the four functional assessment tests, the BI, the Tinetti, the BRASS and

the Scala IIIA, imply that some of them may be redundant and therefore might possibly be substituted by other more relevant assessment tests, for example of frailty and nutritional status. The lack of predictive value of the BRASS and Scala III, in predicting recovery, may justify the removal of these tests in the fixed admission schedule. The Tinetti scale includes quite extensive testing of the patients and is rather time-consuming. At the same time, the Tinetti score was strongly correlated to the BI score, however, the predictive value was lower than that of the BI, concerning the association with a good recovery. We therefore conclude that, from a clinical point of view, assessing the functional status simply by recording BI score at admission to subacute care, and one day before discharge, gives the best trajectory of the patient's functional recovery potential. The usefulness of BI assessments and its association with recovery has been demonstrated in several other studies [8 19 22].

Patients without symptoms of depression were more likely to have a good recovery than patients with symptoms of depression. These results are in accordance with earlier studies concluding that older hospitalized patients with depressive symptoms are at higher risk of unfavorable outcome and mortality [23-25]. Significant higher values of GDS were recorded on admission (indicating that the patients were more depressed) (Tab. I) than one day before discharge. However, this is most likely due to the acute mental stress of the hospitalization and transfer to the subacute ward, and a GDS performed at this time may give false results regarding whether the patient is depressed or not. Accordingly, we conclude that GDS is an important and valuable assessment tool, however, this test should optimally be performed once, sometime after admission, but before discharge, when the patient is not under acute stress of the acute hospitalization and transfer to the subacute ward.

Patients without symptoms of cognitive impairment were two times more likely to have a good recovery than patients with symptoms of cognitive impairment. The MMSE assessment at admission and one day before discharge demonstrated a strong correlation. Performing this test at admission, when the patient may be under acute stress, may be an extra burden both on the patient and the examiner, and we recommend that also this assessment should be performed only once during the stay in the subacute ward, before discharge, when the patients are more adjusted to the hospital situation. Patients treated in the subacute ward, in general, had not yet recovered fully from their medical condition, and most of them had a substantial functional loss. Thus they were not directly comparable to patients in an acute medical/geriatric hospital unit or to patients in a geriatric rehabilitation unit, but rather share characteristics of both groups. Many of the patients in the subacute ward, and especially those with a poor outcome, share the characteristics of frail old people with reduced physical, cognitive and mental status, in addition to reduced ability to cope and recover after the acute disease [26]. The present study, indicating that both functional loss, depression and cognitive impairment were associated with recovery after subacute care, is in accordance with a literature review of Campbell et al., concluding that risk assessment in patients after acute hospitalization is complex, and that both functional status and cognitive status affects the outcome in older hospitalized medical patients [27].

A limitation of the present study is that we have only reported short term recovery, while only follow up over time can confirm the importance of improvement in ADL, depressive symptoms and cognitive impairment, as predictors of future recovery. Furthermore, the patients were recruited from the same area and treated in a single institution; thus, the generalizability of the study may be limited, and the results of the present study cannot be used to tailor subacute care to individual patients. The strength of the study is a very high inclusion rate and that extensive functional assessment tests were performed on nearly all of the patients. The adjustment for several possible confounding factors permits a more confident interpretation of the findings.

We conclude that assessing the functional status with BI at admission and during the hospital stay, before discharge, as well as performing GDS and MMSE once during the stay, may give the best prediction of recovery after subacute care. Assessment with BI gives the optimal prediction of short term recovery, and further assessment with some of the other functional tests may be redundant and could be substituted with the assessment of frailty and nutrition.

ACKNOWLEDGEMENTS

This work was supported by a grant from the Western Norway Regional Health Authority (JFA).

References

1 Boyd CM, Landefeld CS, Counsell SR, et al. *Recovery of activities of daily living in older adults after hospitalization for acute medical illness*. J Am Geriatr Soc 2008;56:2171-9.

2 Wong RY, Miller WC. *Adverse outcomes following hospitalization in acutely ill older patients*. BMC Geriatr 2008;8:10.

3 Gill TM, Gahbauer EA, Han L, et al. *Factors associated with recovery of prehospital function among older*

persons admitted to a nursing home with disability after an acute hospitalization. J Gerontol A Biol Sci Med Sci 2009;64:1296-303.

4 Bachmann S, Finger C, Huss A, et al. *Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials*. BMJ 2010;340:c1718.

5 Gindin J, Walter-Ginzburg A, Geitzen M, et al. *Predictors of rehabilitation outcomes: a comparison of Israeli and Italian geriatric post-acute care (PAC) facilities using the minimum data set (MDS).* J Am Med Dir Assoc 2007;8:233-42.

6 Boffelli S, Cassinadri A, Mercurio F, et al. *Le cure sub acute fra ospedale e territorio: una nuova opportunita di cura geriatrica*. G Gerontol 2014;62:21-8.

7 Regione Lombardia. *Determinazioni in ordine alla gestione del servizio socio sanitario regionale per l'esercizio 2011 - II° provvedimento di aggiornamento in ambito sanitario*. Deliberazione n° IX/1479, seduta del 30/03/2011.

8 Rozzini R, Sabatini T, Cassinadri A, et al. *Relationship between functional loss before hospital admission and mortality in elderly persons with medical illness*. J Gerontol A Biol Sci Med Sci 2005;60:1180-3.

9 Sleiman I, Rozzini R, Barbisoni P, et al. *Functional trajectories during hospitalization: a prognostic sign for elderly patients.* J Gerontol A Biol Sci Med Sci 2009;64:659-63.

10 Heim N, van Fenema EM, Weverling-Rijnsburger AW, et al. *Optimal screening for increased risk for adverse outcomes in hospitalised older adults.* Age Ageing 2015;44:239-44.

11 Abrahamsen JF, Rozzini R, Boffelli S, et al. *Comparison of Italian and Norwegian postacute care settings for older patients in need of further treatment after hospitalization.* J Aging Res Clin Practice 2015;4:218-25.

12 Mahoney FI. *Functional Evaluation: the Barthel Index*. Md State Med J 1965;14:108-12.

13 Tinetti ME. *Performance-oriented assessment of mobility problems in elderly patients.* J Am Geriatr Soc 1986;34:119-26.

14 Blaylock A, Cason CL. *Discharge planning predicting patients' needs.* J Gerontol Nurs 1992;18:5-10.

15 Lanctot KL, Hsiung GY, Feldman HH, et al. *Assessing the validity of deriving clinical dementia rating (CDR) global scores from independently-obtained functional rating scale (FRS) scores in vascular dementia with and without Alzheimer's disease*. Int J Geriatr Psychiatry 2009;24:1174-6.

16 Folstein MF, Folstein SE, McHugh PR. *"Mini-mental state". A practical method for grading the cognitive state of patients for the clinician.* J Psychiatr Res 1975;12:189-98.

17 Sheikh J, Yesavage J. *Geriatric depression scale (GDS). Recent evidence and development of a shorter version.* Clin Gerontol 1986;5:165-73.

18 Parmelee PA, Thuras PD, Katz IR, et al. *Validation of the Cumulative Illness Rating Scale in a geriatric residential population.* J Am Geriatr Soc 1995;43:130-7.

19 Bellelli G, Magnifico F, Trabucchi M. *Outcomes at 12 months in a population of elderly patients discharged from a rehabilitation unit.* J Am Med Dir Assoc 2008;9:55-64.

20 Gill TM, Allore HG, Gahbauer EA, et al. *Change in disability after hospitalization or restricted activity in older persons.* JAMA 2010;304:1919-28.

21 Covinsky KE, Justice AC, Rosenthal GE, et al. *Measuring prognosis and case mix in hospitalized elders. The importance of functional status*. J Gen Intern Med 1997;12:203-8.

22 Inouye SK, Peduzzi PN, Robison JT, et al. *Importance of functional measures in predicting mortality among older hospitalized patients.* JAMA 1998;279:1187-93.

23 Covinsky KE, Kahana E, Chin MH, et al. *Depressive symptoms and 3-year mortality in older hospitalized medical patients.* Ann Intern Med 1999;130:563-9.

24 Bula CJ, Wietlisbach V, Burnand B, et al. *Depressive symptoms as a predictor of 6-month outcomes and services utilization in elderly medical inpatients.* Arch Intern Med 2001;161:2609-15.

25 Cullum S, Metcalfe C, Todd C, et al. *Does depression predict adverse outcomes for older medical inpatients? A prospective cohort study of individuals screened for a trial.* Age Ageing 2008;37:690-5.

26 Bortz WM. *A conceptual framework of frailty: a review*. J Gerontol A Biol Sci Med Sci 2002;57:M283-8.

27 Campbell SE, Seymour DG, Primrose WR. *A systematic literature review of factors affecting outcome in older medical patients admitted to hospital.* Age Ageing 2004;33:110-5.