The Role of Cognition and Depression in Predicting Functional Outcome in Geriatric Medical Rehabilitation Patients

Michael J. Nanna
Rehabilitation Institute of Michigan

Peter A. Lichtenberg
Michelle Buda-Abela
Wayne State University

Jeffrey T. Barth
University of Virginia

The roles depression and cognition play in activities of daily living (ADL) and ambulation recovery in geriatric patients were investigated. Subjects consisted of 423 medical rehabilitation inpatients between the ages of 60 and 99. Depression and cognition as measured by standard tests at admission were found to be significantly related to performance on ADLs and ambulation at admission and discharge. Furthermore, measures of depression and cognition accounted for 7% of unique discharge ADL variance above and beyond that accounted for by admission level of ADL functioning, demographic variables, and number of existing medical conditions. Level of depression and quality of cognitive abilities did not, however, predict ambulation recovery in a regression model. Overall, depression and cognition appear to play a significant role in functional recovery. Treatment strategies for multidisciplinary team members are provided.

The purpose of geriatric rehabilitation is to return patients to maximal activities of daily living (ADL) and ambulation. Wolinsky, Callahan, Fitzgerald, and Johnson (1993) underscored the importance of independent ADL skills and ambulation in the elderly through their investigation using the Longitu-

AUTHORS' NOTE: Address correspondence to Michael J. Nanna, M.Ed., Rehabilitation Institute of Michigan, Research Department, Room 520, 261 Mack Boulevard, Detroit, MI 48201.

dinal Study on Aging database ($N = 3,646$ respondents) between 1984 and 1988. They found that the greatest risk of nursing home placement and mortality was associated with decreased ADL skills and with lower extremity dysfunction. Unfortunately, these elderly patients are often only assessed on mechanical functioning (i.e., gait, balance, strength, range of motion) and/or ADLs to determine their potential for successful rehabilitation and functional outcome (Lichtenberg et al., 1994). Problems such as depression and cognitive deficits are typically overlooked as potential contributors to functional outcome in geriatric rehabilitation populations, despite evidence that they contribute to long-term adaptation. Our study of this geriatric rehabilitation population attempts to document the importance of these cognitive and affective factors in functional outcome.

The Role of Depression in Recovery

Depression is twice as common in most post stroke patients as it is in community elderly. Parikh et al. (1990) studied the relationship of depression to ADL performance 2 years post stroke. Patients who had been depressed in the hospital were significantly more impaired in physical activities 2 years after their stroke than were the nondepressed patients. Bacher, Korner-Bitensky, Mayo, Becker, and Coopersmith (1990) documented similar findings in their 12-month study of 48 post stroke patients. By the end of the 12-month interval, ADLs had increased in all patients but had improved significantly more in nondepressed patients.

Other researchers have demonstrated a relationship between functional recovery and depression in geriatric patients following orthopedic injuries. Cummings et al. (1988) provided a 6-month follow-up of 92 elderly, hip-fracture patients without severe cognitive deficits. At 6 months, a correlation was found between increased depression and poor functional status (i.e., walking and advanced ADL).

Depressive symptomatology was also associated with poorer outcome in basic and advanced ADL function 1 year after a hip fracture. In two separate studies, Magaziner, Simonsick, Kashner, Hebel, and Kenzora (1990) and Mossey, Mutran, Knott, and Craik (1989), using samples of 536 and 211 geriatric patients, respectively, assessed elderly women at 2, 6, and 12 months after hip fractures. Both studies found depression to be a significant predictor of ADL recovery for their samples.

Although it appears certain that depression is at least related to functional outcome in this population, all of the above studies suffer flaws. Depression was often treated as a dichotomous variable (depressed vs. nondepressed) and no control variables were used in some studies to partial out the effects

of age, gender, and medical conditions on functional recovery. Nevertheless, it is clear that depression is an important variable in geriatric rehabilitation and functional outcome.

The Role of Cognition in Recovery

Cognitive functioning has been associated with physical function. In a prospective study of 336 independent living elderly, Tinetti, Speechley, and Grinter (1988) found that one third of their sample experienced falls and that risk factors associated with falling included the use of sedatives, cognitive impairment, lower extremity disability, foot problems, and palomental reflex problems.

Carter, Oliveira, Duponte, and Lynch (1988) showed that stroke patients receiving cognitive retraining demonstrated significant improvement in personal hygiene and in a second study found that ADL functioning for stroke patients was significantly correlated with performance in cognitive skills. Good mental status was a crucial factor for successful rehabilitation at 4 months in 68 of 70 surviving patients without signs of dementia.

These studies also suffer from lack of appropriate controls for other significant factors such as severity of medical condition and age, yet it is clear that cognitive abilities affect functional outcome.

The Relationship of
Cognition and Depression

A relationship between depression and cognition has been demonstrated in the adult neuropsychology literature, and to a more limited extent in the geriatric rehabilitation setting. Billig, Ahmed, Kenmore, Amaral, and Shakhashiri (1986) found that more than 60% of depressed hip-fracture patients also had cognitive impairment, and studies of depressed elderly have consistently found memory impairment (Gibson, 1981; LaRue, D'Elia, Clark, Spar, & Jarvik, 1986; Lichtenberg, Ross, Millis, & Manning, 1995).

The present study served to investigate the relationship of cognition and depression to functional outcome in postacute geriatric rehabilitation. The following specific hypotheses were tested: (a) There will be significant, positive relationships between depression and cognition with ADL and ambulation functioning; and (b) depression and cognition at admission will influence outcomes in terms of ADL and ambulation variance at discharge above and beyond that accounted for by levels of initial functioning and demographic and medical variables.

Method

Subjects

The sample consisted of 423 consecutive admissions to a university hospital-based geriatric admissions unit between 1991 and 1994. Only patients who were aged 60 or older were included in this study. Two thirds of the subjects were women and one third were men. Sixty percent of the subjects were African American and 40% were White. Full demographic details can be found in Table 1. The primary medical diagnoses of the sample were as follows: 25% had a hip fracture, 21% had a fracture of the neck of the femur, 18% had abnormality of gait, 12% had hemiplegia, 11% had a stroke diagnosis, and 5% had a diagnosis of deconditioning (malaise and fatigue) associated with long-term illness and/or recovery from surgery.

Procedure

As part of a routine neuropsychological assessment, each patient was orally administered the Geriatric Depression Scale (GDS) and the Dementia Rating Scale (DRS) within 7 days of admission by a psychology staff member. Patients needed to be lucid enough and have the attentional skills needed to complete the $1\frac{1}{2}$ hours of evaluation. Each patient also received independent evaluations by a physical therapy staff member and an occupational therapy staff member, using the Functional Independence Measure (FIM) at admission and discharge. Other predictor variables were collected from the patient's medical charts.

Instruments

Geriatric Depression Scale

The GDS was created in the early 1980s (Brink et al., 1982) and was the first screening measure developed and validated for the elderly. The GDS is composed of 30 yes/no self-referent statements and has been found to be a highly reliable and valid measure of depression in the elderly. In an older, less-educated sample that approximates our own, Parmalee, Lawton, and Katz (1989) reported an internal consistency alpha coefficient of .91 for the GDS, and a test/retest correlation coefficient of .85.

Dementia Rating Scale

The DRS (Mattis, 1988) was used to measure cognitive functioning. It was initially constructed to assess the general cognitive abilities of demented patients. The scale includes a broad range of attention, language, memory, reasoning, and construction tasks. In a study of 30 demented patients, Coblentz et al. (1973) provided good evidence for test-retest reliability ($r = .97$) and concurrent validity between the DRS and the Wechsler Adult Intelligence Scale (WAIS) IQ score ($r = .75$). An estimate of split-half reliability was found to be adequate as well ($r = .90$; Gardner, Oliver-Munoz, Fisher, & Empting, 1981).

Functional Independence Measure

The FIM was developed to provide uniform assessment of severity of disability and medical rehabilitation outcome. This 18-item, seven-level scale ranging from 1 (*total assistance*) to 7 (*total independence*) was designed to be completed by rehabilitation staff according to objective behavioral criteria. The FIM assesses domains such as self-care, sphincter control, mobility, locomotion, communication, and social and cognitive skills. It is intended to be a comprehensive measure of disability. For instance, Item 3 measures an individual's ability to bathe himself or herself, Item 10 looks at the ability to transfer to and from the toilet, and Item 14 assesses an individual's ability to walk up and down 12 to 14 stairs. Studies have indicated high levels of reliability and validity for the FIM. Acceptable levels of clinical interrater agreement ($r = .93$ to $r = .97$) have been reported by Hamilton, Laughlin, Granger, and Kayton (1991). In addition, there is evidence of good concurrent validity with patients recovering from stroke (Wagner & Zuchingna, 1988). Researchers have also demonstrated the FIM's utility when working with geriatric and demented populations (Wilking, Dowling, & Heeran, 1991).

Analysis

Hierarchical multiple regression analyses were performed to better determine the predictors of ADL and ambulation skills at discharge. A forced-variable entry strategy was used based on a priori predictions. Variables were entered in five blocks. The ADL or ambulation skills scores upon admission were entered first; demographic variables second (age, race, education, and gender); number of existing medical conditions and length of stay (LOS)

were entered third. Number of medical conditions was used here without any attempt to measure severity of disease. Cognition (DRS) was entered fourth, and depression (GDS) last.

Results

Upon admission, 5% of the sample's mode of locomotion was walking, 90% used a wheelchair, and 5% walked and used a wheelchair. At discharge, 11% were walking, 72% were using a wheelchair, and 17% were both walking and using a wheelchair. The means and standard deviations of the independent and dependent variables are listed in Table 1. Upon admission, the patient's mean functioning for ambulation was in the range of modified dependence with moderate assistance, and mean functioning for ADLs was in the range of modified dependence with only supervision. At discharge, the patient's mean functioning for ambulation had improved to modified dependence with only supervision, and mean functioning for ADLs had improved to modified independence. There were 104 patients who scored in the depressed range on the GDS ($M = 15.80$; $SD = 3.99$) and 269 patients who scored in the nondepressed range ($M = 4.93$; $SD = 2.77$). The sample was composed of 234 patients who scored in the range of normal cognitive functioning according to the DRS ($M = 132.41$; $SD = 5.07$), and 189 patients who scored in the range of cognitive deficit ($M = 105.11$; $SD = 13.87$). It should be noted that the characteristics of this sample are typical only of urban rehabilitation centers having large proportions of African American patients and, in general, having patients with low education levels.

Pearson product-moment and point-biserial correlations between demographic, medical, cognitive, and affective measures with the ADL and ambulation scores can be found in Table 2. As expected, the number of medical conditions, length of stay, and depression were inversely related to ADL skills at admission and discharge, indicating that those patients who had fewer medical conditions, shorter lengths of stay, and who were less depressed had higher ADL skills. The DRS was directly related to ADL skills at admission and discharge, which indicated that higher cognitive functioning was associated with higher ADL scores. In addition, gender was also found to be inversely related to discharge ADL scores, indicating that men had better ADL skills at discharge.

As can be seen in Table 2, the pattern of correlations was slightly different in regard to ambulation. Age, gender, length of stay, and depression were inversely related to admission ambulation skills. This indicates that younger patients, males, those with shorter lengths of stay, and the less depressed

Table 1.   Means (*M*) and Standard Deviations (*SD*) of Demographic Variables, Medical Variables, Geriatric Depression Scale (GDS) Scores, Dementia Rating Scale (DRS) Scores, Ambulation Skills, and Activities of Daily Living (ADL) Skills

Variable	M	SD	Range
Years of education	9.87	3.48	0-20
Age	77.92	7.45	60-99
Number of medical conditions	7.45	1.48	0-8
Length of stay (days)	18.43	7.13	4-54
GDS Score	7.96	5.8	0-28
DRS Score	120.21	16.87	50-144
Admission ADL Score	29.53	7.27	9-48
Discharge ADL Score	36.53	7.16	15-49
Admission Ambulation Score	3.42	1.53	1-7
Discharge Ambulation Score	4.93	1.21	1-7

patients had higher ambulation skills upon admission. In addition, the DRS was directly related to admission ambulation skills, indicating that higher cognitive functioning was associated with better ambulation at admission. At discharge, only depression and cognitive functioning were found to be significantly related to ambulation. The GDS held an inverse relationship, indicating the less depressed patients were ambulating better at discharge. It was further found that the DRS held a direct relationship with discharge ambulation, indicating that higher cognitive scores were associated with higher ambulation scores at discharge.

Table 2 also describes relationships among the independent variables. It was found that education, depression, and cognitive functioning were negatively related to age, indicating that education, cognitive functioning, and depressive symptoms were lower among older participants. Race was positively related to education and cognitive functioning, indicating that the Caucasian patients had higher educational levels and better DRS scores. Gender was also positively related to cognitive functioning, with the females obtaining higher DRS scores. In addition, consistent with many normative neuropsychological studies, a direct relationship between education and cognitive functioning was found. The patients with higher educational levels scored better on the DRS. The number of medical conditions held a positive relationship to length of stay, and depression and cognition were negatively correlated, indicating that greater levels of depression were related to lower cognitive functioning.

In Table 3 the results for the prediction of discharge ADL skills are presented. Altogether, 61% of the variance in discharge ADL skills was

Table 2. Correlations Among Predictor and Criterion Measures

	ADL-A	ADL-D	AMBUL-A	AMBUL-D
Age	-.07	-.05	-.10*	-.05
Race[a]	-.01	-.02	.05	.02
Gender[b]	.05	.13*	-.15*	-.07
Years of education	.03	-.01	-.01	-.06
Number of medical conditions	-.14*	-.15*	-.03	-.07
Length of stay (LOS)	-.36*	-.22*	-.17*	.02
Geriatric Depression Scale (GDS)	-.12*	-.28*	-.18*	-.19*
Dementia Rating Scale (DRS)	.22*	.30*	.13*	.20*

Interrelationships	Age	Race	Gender	Education	Medical Conditions	LOS	GDS	DRS
Age	1.00	-.03	.05	-.12*	.02	.06	-.12*	-.24*
Race[a]		1.00	-.01	.26*	.08	.06	.10	.23*
Gender[b]			1.00	.05	-.08	-.08	-.08	.10*
Years of education				1.00	-.07	.03	.05	.23*
Number of medical conditions					1.00	.13*	.06	-.05
Length of stay						1.00	.03	-.01
Geriatric Depression Scale							1.00	-.20*
Dementia Rating Scale (DRS)								1.00

NOTE: ADL-A = Activities of Daily Living-Admission, ADL-D = Activities of Daily Living-Discharge, AMBUL-A = Ambulation-Admission, AMBUL-D = Ambulation-Discharge.
a. Race was dummy coded 0 = Black and 1 = White.
b. Gender was dummy coded 0 = male and 1 = female.
* $p < .05$.

predicted by the nine independent variables. Admission ADL skills, entering the regression first, by itself accounted for 53% of the variance in discharge ADL skills. The demographic variables, number of medical conditions, and length of stay did not significantly add to the prediction of discharge ADL scores. Cognition, entering the regression fourth, significantly added 3% of predictable variance. Depression, entering the equation last, was also significant and added 4% to the prediction of ADL skills at discharge. After the last block of variables was added to the equation, it was found that admission ADL skills, gender, education, cognition, and depression all significantly predicted discharge ADL skills.

Table 4 reports results for the prediction of discharge ambulation skills. Overall, only 14% of the variance in discharge ambulation skills was predicted by the nine independent variables. Admission ambulation skills,

Table 3. Stepwise Hierarchical Regressions of Demographic, Medical, Cognitive, and Affective Measures on Discharge Activities of Daily Living (ADL) Skills

Block	Variable	Beta	F	Significance F	R^2 Change	Cumulative R^2
1	Admission ADL	-.73	282.78	.00	.53*	.53*
2	Race[a]	-.00	-.00	.96	—	—
	Gender[b]	-.10	5.69	.02	—	—
	Age	.04	.74	.39	—	—
	Education	.07	2.27	.14	—	—
					.01	.54*
3	Number of medical conditions	.03	.54	.46	—	—
	Length of stay	-.06	1.85	.18	—	—
					.00	.55*
4	Dementia Rating Scale	.19	16.25	.00	.03*	.58*
5	Geriatric Depression Scale	.20	21.95	.00	.04*	.61*

a. Race was dummy coded 0 = Black and 1 = White.
b. Gender was dummy coded 0 = male and 1 = female.
* $p < .001$.

Table 4. Stepwise Hierarchical Regressions of Demographic, Medical, Cognitive, and Affective Measures on Discharge Ambulation Skills

Block	Variable	Beta	F	Significance F	R^2 Change	Cumulative R^2
1	Admission ambulation	.31	25.27	.00	.09*	.09*
2	Race[a]	.01	.01	.93	—	—
	Gender[b]	-.12	3.49	.06	—	—
	Age	.03	.26	.61	—	—
	Education	-.03	.15	.70	—	—
					.02	.11*
3	Number of medical conditions	-.10	2.69	.10	—	—
	Length of stay	.11	2.93	.09	—	—
					.02	.13*
4	Dementia Rating Scale	-.04	.46	.50	.00	.13*
5	Geriatric Depression Scale	-.11	2.91	.09	.01	.14*

a. Race was dummy coded 0 = Black and 1 = White.
b. Gender was dummy coded 0 = male and 1 = female.
* $p < .001$.

entering the regression first, by itself accounted for 9% of the variance in discharge ambulation skills. The demographic variables, number of medical conditions, length of stay, and cognition did not significantly add to the prediction of discharge ambulation scores. There was a trend for level of admission depression, entered last, to significantly add to the prediction of discharge ambulation skills ($p = .09$). After the last block of variables was added, it was found that admission ambulation skills and gender significantly predicted the discharge ambulation skills score.

Discussion

Results of this study supported the hypothesis that depression and cognition are related to functional outcome. That is, depression and cognition at admission as measured by the GDS and the DRS, respectively, accounted for unique ADL variance at discharge above that accounted for by admission levels of functioning, demographic variables, and coexisting medical conditions. Indeed, both cognition and depression at admission significantly added to the prediction of ADL skills at patient discharge, accounting for an additional 7% of variance above and beyond the 55% accounted for by admission ADLs, demographic variables, number of existing medical conditions, and length of stay.

Even though there was a significant relationship, the data did not support the hypothesis that cognition and depression are predictors of ambulation recovery. Ambulation skills, which have been much of geriatric rehabilitation's focus, were significantly, albeit mildly, correlated with cognition and depression scores at admission and discharge, yet these predictors were redundant to what was predicted by initial ambulation skills. Interestingly, no predictor, even initial ambulation skills, accounted for much discharge ambulation variance. Investigation of Table 1 displays the lack of substantial gains made in ambulation skills during inpatient rehabilitation. Mean scores moved from moderate hands-on assistance at admission to verbal guidance at discharge. Longitudinal studies may explicate the best predictors of ambulation recovery.

The idea that both cognition and depression may play a role in functional recovery in geriatric rehabilitation patients has important implications. Depression detection and treatment can be addressed in the following ways. First, because depression is often poorly evaluated by rehabilitation team professionals (Lichtenberg, Gibbons, Nanna, & Blumenthal, 1993) routine screening of geriatric rehabilitation patients for depressive symptoms should be completed early in the rehabilitation stay. This can be accomplished with

the GDS (Brink et al., 1982) or other standardized assessment tools, as well as by thorough interview technique. Psychological counseling and/or pharmacologic treatment can begin during rehabilitation. Physical, occupational, and speech therapists can augment depression treatment by using techniques such as graphing physical progress and providing positive feedback to patients. This can help combat the depressed patient's tendency to overlook positive events.

Identification of cognitive deficits through the use of standardized tests that have norms for elderly individuals can lead to more appropriate treatment planning. Three major questions to address through cognitive testing in rehabilitation are: (a) Is there evidence of cognitive impairment? (b) What are the patient's cognitive strengths and weaknesses? and (c) How can cognitive evaluation be used in practical treatment planning? For example, memory notebooks can be used as a compensatory strategy for individuals with certain types of deficits (e.g., relatively intact storage but impaired retrieval). This can help to increase functional performance during inpatient stay and upon discharge to another setting.

The results of this study indicate that depression and cognition may contribute unique influences in geriatric rehabilitation contributing to excess disability in ADL functioning (but not ambulation). Additional investigation using other measures of ADLs and ambulation is warranted. A further implication of this study is that ADL function and ambulation should be addressed as separate issues by geriatric rehabilitation professionals. This research provides further support for assessment and intervention in the areas of cognitive and affective functioning in geriatric rehabilitation.

References

Bacher, Y., Korner-Bitensky, N., Mayo, N., Becker, R., & Coopersmith, H. (1990). A longitudinal study of depression among stroke patients participating in a rehabilitation program. *Canadian Journal of Rehabilitation, 1*, 27-37.

Billig, N., Ahmed, S., Kenmore, P., Amaral, D., & Shakhashiri, M. (1986). Assessment of depression and cognitive impairment after hip fracture. *Journal of the American Geriatric Society, 34*, 499-503.

Brink, T. L., Yesavage, J., Lum, O., Herrsema, P., Adey, M., & Rose, T. (1982). Screening tests for geriatric depression. *Clinical Gerontologist, 1*, 37-43.

Carter, G. T., Oliveira, D. O., Duponte, J., & Lynch, S. V. (1988). The relationship of cognitive skills performance to activities of daily living in stroke patients. *American Journal of Occupational Therapy, 42*, 449-455.

Coblentz, J. M., Mattis, S., Zingesser, L., Kasoff, S. S., Wisniewski, H. M., & Katzman, R. (1973). Presenile dementia: Clinical aspects and evaluation of cerebrospinal fluid dynamics. *Archives of Neurology, 29*, 299-308.

Cummings, S., Phillips, S., Wheat, M., Black, D., Goosby, E., Wlodarcyzk, D., Trafton, P., Jergesen, H., Winograd, C., & Hulley, S. (1988). Recovery of function after hip fracture: The role of social supports. *Journal of the American Geriatrics Society, 36*, 801-806.

Gardner, R., Oliver-Munoz, S., Fisher, L., & Empting, L. (1981). Mattis Dementia Rating Scale: Internal reliability study using a diffusely impaired population. *Journal of Clinical Neuropsychology, 3*, 271-275.

Gibson, A. (1981). A further analysis of memory loss in dementia and depression in the elderly. *British Journal of Clinical Psychology, 20*, 179-185.

Hamilton, B. B., Laughlin, J. A., Granger, C. V., & Kayton, R. M. (1991). Interrater agreement of the seven level Functional Independence Measure (FIM). *Archives of Physical Medicine and Rehabilitation, 69*, 790.

LaRue, A., D'Elia, L., Clark, E., Spar, J., & Jarvik, L. (1986). Clinical tests of memory in dementia, depression and healthy aging. *Journal of Psychology and Aging, 1*, 69-77.

Lichtenberg, P. A., Christensen, B., Metler, L., Nanna, M., Jones, G., Reyes, J., & Blumenthal, F. (1994). A preliminary investigation of the role of cognition and depression in predicting functional recovery in geriatric rehabilitation patients. *Advances in Medical Psychotherapy, 7*, 109-124.

Lichtenberg, P. A., Gibbons, T. A., Nanna, M. J., & Blumenthal, F. (1993). Physician detection of depression in medically ill elderly. *Clinical Gerontologist, 13*(1), 81-90.

Lichtenberg, P. A., Ross, T. P., Millis, S. R., & Manning, C. A. (1995). The relationship between depression and cognition in older adults: A cross-validation study. *Journal of Gerontology: Psychological Sciences, 50b*(1), 25-32.

Magaziner, J., Simonsick, E. M., Kashner, J. M., Hebel, J. R., & Kenzora, J. E. (1990). Predictors of functional recovery one year following hospital discharge for hip fracture: A prospective study. *Journal of Gerontology: Medical Sciences, 45*, m101-m107.

Mattis, S. (1988). *Dementia Rating Scale: Professional manual*. Odessa, FL: Psychological Assessment Resources.

Mossey, J. M., Mutran, E., Knott, K., & Craik, R. (1989). Determinants of recovery after hip fracture: The importance of psychosocial factors. *American Journal of Public Health, 79*, 279-286.

Parikh, R., Robinson, R., Lipsey, J., Starkstein, S., Federoff, J., & Price, T. (1990). The impact of post-stroke depression on recovery in activities of daily living. *Archives of Neurology, 47*, 785-789.

Parmalee, P. A., Lawton, M. P., & Katz, I. R. (1989). Psychometric properties of the Geriatric Depression Scale among the institutionalized aged. *Psychological Assessment, 1*, 331-338.

Tinetti, M., Speechley, M., & Grinter, S. (1988). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine, 319*, 1701-1707.

Wagner, M. T., & Zachigna, C. J. (1988). Longitudinal comparison of the Barthel and FIM during the first six months of recovery from stroke. *Archives of Physical Medicine and Rehabilitation, 69*, 775.

Wilking, S. V., Dowling, T. M., & Heeran, T. (1991). Correlations of Functional Independence Measure with Management Minutes Questionnaire on a special care Alzheimer unit. *Journal of the American Geriatrics Society, 39*(8), 76.

Wolinsky, F. D., Callahan, C. M., Fitzgerald, J. F., & Johnson, R. J. (1993). Changes in functional status and the risks of subsequent nursing home placement and death. *Journal of Gerontology: Social Sciences, 48*, 93-101.

Michael J. Nanna is currently the manager of clinical research and of the Southeastern Michigan Spinal Cord Injury System at the Rehabilitation Institute of Michigan. He is also a doctoral candidate and adjunct instructor in the Department of Theoretical and Behavioral Foundations in the College of Education at Wayne State University, where he is pursuing a Ph.D. in educational evaluation and research (statistics).

Peter A. Lichtenberg, Ph.D., is currently an associate professor in the Department of Physical Medicine and Rehabilitation at the Wayne State University School of Medicine and the associate director of rehabilitation psychology and neuropsychology at the Rehabilitation Institute of Michigan. Lichtenberg earned his Ph.D. in clinical psychology from Purdue University.

Michelle Buda-Abela formerly served as the coordinator of the Southeastern Michigan Spinal Cord Injury System and is currently a doctoral candidate in developmental psychology in the Psychology Department at Wayne State University.

Jeffrey T. Barth, Ph.D., is currently a professor of psychology and psychiatry in the Department of Psychiatric Medicine at the University of Virginia School of Medicine and the chief of psychology in the University of Virginia Department of Psychiatric Medicine.