The Outcomes of Patients Newly Admitted to Nursing Homes after Hip Fracture

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ABSTRACT

Objectives. The outcomes of elderly, hospitalized patients discharged to nursing homes after hip fracture were examined.

Methods. For 2624 hip fracture patients admitted to any of 43 proprietary nursing homes between 1984 and 1988, admission assessments were examined in relation to 1-month outcomes.

Results. Mean patient age was 82 ± 7 y; 85% of the sample were female. Within 1 month after discharge, 24% had returned home, 12% had been rehospitalized, 3% had died, and 61% remained in the nursing home. Characteristics significantly associated with mortality included disorientation, functional dependency, neurologic diagnoses, and use of cardiac medications, antidepressants, or narcotics. Rehospitalization was significantly associated with age, gender, living with someone, being ambulatory, and functional dependency. Returning home was associated with younger age, living with someone, being ambulatory, and having no disorientation, functional dependency, or psychiatric or neurologic diagnoses, nor any pressure sores.

Conclusions. Better-functioning persons and those with social support returned home; physically and cognitively impaired persons and those taking narcotics, cardiac medications, or antidepressants were likely to die; and younger men, those with social support, those with functional dependency, and those who were free of disorientation were more likely to be rehospitalized. (*Am J Public Health.* 1994;84:1281–1286)

Introduction

Since the advent of prospective payment to hospitals, the recuperative phase of treatment for acute conditions such as hip fracture has shifted to the nursing home. Hospital length of stay for hip fracture patients has decreased by 4 to 9 days,[1-4] the number of in-hospital physical therapy sessions has decreased by as much as 50%,[1-3] the number of patients discharged to nursing homes has more than doubled,[2] and the percentage of patients still in nursing homes 6 months after hospital discharge has increased from 13% to 39%.[2] This shifting of the rehabilitative burden from the acute care hospital to the nursing home makes it particularly important for skilled nursing homes to identify patient characteristics associated with either successful rehabilitation or deterioration.

Two recent but small (n's = 114 and 151) prospective studies have examined patient- and setting-specific characteristics associated with returning home vs staying in the nursing home.[5,6] To expand upon these studies, we examined determinants of all potential outcomes (returning home, returning to hospital, dying, or remaining in the nursing home) in patients newly admitted to skilled nursing homes following hip fracture. We hypothesized that individuals with more comorbidity, those who were more functionally dependent, disoriented, immobile, and taking more drugs, would be less likely to return home and more likely to return to the hospital or to die.

Methods

Study Population

Data used in this study come from regular assessments of residents in 43 continuously owned facilities of the National Health Corporation located in Missouri (n = 9), Kentucky (n = 4), South Carolina (n = 5), and Tennessee (n = 25). The sample comprised all residents 65 years of age and older whose primary insurer was Medicare and who had been newly admitted to one of the nursing homes from a hospital between 1984 and 1988 with a primary *International Classification of Diseases,* Ninth Revision, Clinical Modification[7] (ICD-9-CM) diagnosis of hip fracture (ICD-9-CM codes 820.00, 820.02, 820.03, 820.09, 820.20, 820.21, 820.22, and 820.8). These new admissions had never been residents of a National Health Corporation facility, but 38.3% had been institutionalized elsewhere before their hip fractures. The National Health Corporation maintains a comprehensive computerized clinical database of resident characteristics. Data are collected in monthly assessments of all Medicare-covered residents by trained nurses, submitted to a central office for computerization, and reviewed for completeness by corporate staff. Assessments are used within each facility to monitor resident status and to allocate staffing

TABLE 1—Baseline Characteristics of the Sample (n = 2624), by Outcome

	All Patients	Still in Nursing Home	Home	Hospital	Dead
Mean age, y (SD)	83 (7)	83 (7)	81 (7)	82 (7)	85 (7)
Female, %	83	84	84	75	72
Living arrangements, %					
Institutionalized	38	41	27	42	45
Noninstitutionalized	62	59	73	58	55
Able to walk alone or with assistance, %	29	26	38	31	13
Able to perform all ADLs[a], %	59	56	78	48	24
Clear in orientation, %	58	54	78	46	23
No. of secondary diagnoses, %					
0–2	29	28	35	26	22
3–4	34	35	32	32	42
5–8	37	37	33	42	36
Diagnostic categories[b], %					
Infectious disease	7	7	5	9	11
Psychiatric	19	21	12	22	28
Neurological	25	29	17	26	21
Cardiac	49	49	49	50	50
Pressure ulcer, %	20	21	14	25	33
No. of medications, %					
0–3	30	31	30	26	37
4–6	49	50	47	49	36
≥7	22	19	23	25	26
On cardiac medications, %	34	32	32	41	53
On antidepressants, %	5	4	6	5	10
On narcotics, %	17	16	20	16	23

[a]Activities of daily living (ADLs) include bathing, dressing, toileting, transfer, eating/feeding, and grooming.
[b]Diagnostic categories were created by grouping ICD-9-cm diagnoses listed as secondary diagnoses.

resources. Priority is given to obtaining high-quality data, and a 10% sample is audited quarterly by a second specially trained nurse. The average percentage disagreement across all homes between the two nurse assessors was 9% for the subset of variables examined quarterly for reliability (mobility, activities of daily living, continence, pressure ulcers, selected ICD-9 codes, orientation, and behavior) (phone communication, Julia Powell, RN, Vice President of Patient Services, National Health Corporation).

Many National Health Corporation homes admit hospital patients for rehabilitation following an acute illness such as a hip fracture or stroke. Accordingly, these facilities have a higher percentage of residents covered by Medicare (57.2%) than the national average of 11.5% of hip fracture admissions.[8]

Definition of Variables

Variables for this study were derived from resident assessments performed within 7 days of admission to the homes. Independent variables fell into three broad categories: sociodemographic, func-

tional, and medical severity. On the basis of previous literature, variables were chosen from the complete database that might, a priori, be associated with early (within 1 month) transitions from the nursing home. When two variables captured similar information (e.g. "cardiac diagnoses" and "cardiac medications"), we chose one of them. Sociodemographic variables included age, sex, and living situation prior to fracture (alone vs with another person). Functional variables included ability to walk alone or with help (yes/no), orientation (disoriented/occasionally disoriented/clear), and dependency in activities of daily living (bathing, dressing, toileting, transferring, eating). To account for medical disease severity, we postulated a priori that certain categories of secondary diagnoses might influence short-term outcomes in hip fracture patients newly admitted to nursing homes. ICD-9-CM diagnoses were grouped into four such categories: psychiatric diagnoses, cardiac diagnoses, infectious disease diagnoses, and neurological diagnoses. For example, psychiatric diagnoses present in the study population included

"organic psychosis," "schizophrenia," "psychosis," "paranoia," "organic brain damage," and "other mental disorders." We also examined commonly used medications such as cardiac medications, antidepressants, and narcotics. Finally, we categorized patients as to whether or not they had pressure ulcers at admission.

For each subject, outcome status (returned home, remained in nursing home, returned to hospital, died) was examined at 1 month. Since our interest was in identifying characteristics associated with the first transition within 30 days of admission, we did not track subjects past the first transition. Thus a person discharged to a hospital and dying in the hospital within 30 days of nursing home admission would be categorized as a discharge to hospital.

Statistical Analysis

Bivariate associations between independent variables and the four possible outcomes were examined by means of chi-square tests of association. All bivariate associations between independent variables and the four possible outcomes that were significant ($P \leq .10$) were fitted to a polychotomous logistic regression model, a generalization of logistic regression to more than two outcome categories (e.g., home, nursing home, hospital, death). Collapsing any of the four outcome states would obscure important relationships. A polychotomous model assumes that the possible outcomes compete with each other and are mutually exclusive. The parameters of the model were estimated by maximizing a likelihood function by means of the mlogit procedure in STATA Release 3.[9] To interpret coefficients of independent variables in a polychotomous model, one of the outcomes is assigned as a referent category; for this analysis, the referent category was remaining in the nursing home. The adjusted relative risk of an outcome of interest for a given independent variable represents the risk (adjusted for other variables in the model) of experiencing that outcome instead of the referent outcome, given the competing risks of experiencing other possible outcomes. This analysis was repeated after stratifying by living arrangement prior to hip fracture (institutionalized vs noninstitutionalized), since these two groups would be expected to have distinctly different premorbid profiles.

Results

Sample Description

Between 1984 and 1988, 2624 Medicare patients were newly admitted to a National Health Corporation nursing home with a primary diagnosis of hip fracture. The mean age of the sample was 83 (± 7) years, 83% were female, and 38% were living in an institution at the time of their fractures (Table 1). Only 29% were able to walk alone or with assistance, but 59% of the sample were able to perform all activities of daily living. More than half of the subjects were clear in their orientation. The number of secondary diagnoses (out of a possible total of eight) was equally distributed across groupings of 0 through 2, 3 or 4, and 5 through 8. Cardiac diagnoses were listed most often as secondary diagnoses, followed by neurological, psychiatric, and infectious disease diagnoses. Approximately 20% of the sample had pressure ulcers.

Table 2 displays the 1-month transition of the original cohort of 2624 patients and the cohort stratified as to prehospital living situation. Within the first month, 23.7% had returned home, 12.4% had been sent back to an acute care hospital, 3.1% had died, and 60.8% were still in the nursing home. Previously institutionalized hip fracture patients were less likely than previously noninstitutionalized persons to return home (17% vs 28%; P < .05).

Polychotomous Logistic Regression Results

We included all of the above independent variables in a polychotomous logistic regression model except cardiac diagnoses (P = .97, bivariate) and number of secondary diagnoses (collinear with individual diagnostic categories), since all bivariate associations were highly statistically significant (data not shown). As shown in Table 3, after all other variables in the model were controlled, older age reduced the probability of returning home or to hospital. Being female reduced the likelihood of returning to hospital and tended to lower the risk of mortality (not statistically significant at P < .05). Living with someone increased the probability of returning home and of being rehospitalized. Having any dependency in activities of daily living strongly increased the risks of death, rehospitalization, and not being able to return home. Disorientation was the strongest predictor of death and greatly decreased the probability of return-

TABLE 2—First Transition within 30 Days of Admission of Patients Newly Admitted to Nursing Homes with Hip Fractures

Transition	All Patients (n = 2624)	Previously Institutionalized* (n = 1005)	Previously Noninstitutionalized* (n = 1619)
Home, %	23.7	16.9	27.9
Still in nursing home, %	60.8	65.8	57.7
Hospital, %	12.4	13.6	11.6
Dead, %	3.1	3.7	2.8

*P < .0001 for the difference in outcomes between previously institutionalized and noninstitutionalized patients.

TABLE 3—Polychotomous Logistic Regression Analysis[a] for Entire Study Population (n = 2556)

Baseline Characteristic	Home OR	Home 95% CI	Hospital OR	Hospital 95% CI	Death OR	Death 95% CI
Age, y						
65–74	1.00	Referent	1.00	Referent	1.00	Referent
74–85	0.75	0.56, 1.00	0.58	0.40, 0.83	0.77	0.33, 1.83
>85	0.50	0.37, 0.68	0.55	0.38, 0.80	1.55	0.67, 3.56
Female sex	0.85	0.64, 1.12	0.63	0.46, 0.86	0.61	0.35, 1.06
Living with someone	1.64	1.33, 2.01	1.44	1.12, 1.87	1.30	0.81, 2.10
Any ADL dependency[b]	0.62	0.48, 0.79	1.45	1.08, 1.93	2.23	1.22, 4.11
Disorientation						
None	1.00	Referent	1.00	Referent	1.00	Referent
Occasional	0.62	0.48, 0.81	1.52	1.13, 2.05	2.51	1.33, 4.73
Disorientation/coma	0.30	0.19, 0.48	1.05	0.70, 1.58	3.77	1.88, 7.59
Able to walk (alone or with help)	1.35	1.09, 1.68	1.54	1.16, 2.05	0.76	0.38, 1.52
Pressure ulcer	0.73	0.56, 0.96	1.09	0.81, 1.46	1.37	0.83, 2.25
No. of medications						
0–3	1.00	Referent	1.00	Referent	1.00	Referent
4–6	0.99	0.78, 1.26	1.13	0.83, 1.54	0.57	0.33, 1.01
≥7	1.23	0.90, 1.66	1.43	0.98, 2.09	0.78	0.40, 1.51
Cardiac medications	0.98	0.78, 1.23	1.39	1.06, 1.82	2.33	1.42, 3.84
Antidepressants	1.31	0.85, 2.03	1.08	0.61, 1.93	3.12	1.32, 7.39
Narcotics	1.11	0.86, 1.44	1.03	0.73, 1.44	1.86	1.05, 3.31
Infectious disease diagnoses	0.92	0.60, 1.40	1.27	0.82, 1.97	1.31	0.62, 2.79
Psychiatric diagnoses	0.75	0.55, 1.02	0.92	0.67, 1.27	0.78	0.45, 1.35
Neurological diagnoses	0.66	0.51, 0.86	0.75	0.56, 1.00	0.41	0.23, 0.73

Note. OR = adjusted odds ratio for 1-month outcome; CI = confidence interval. Sample size is not 2624 because of missing data for some variables in the model.
[a]"Staying in nursing home" was the referent outcome.
[b]Activities of daily living (ADLs) include bathing, dressing, toileting, transferring, eating/feeding, and grooming.

ing home. The ability to walk slightly increased the likelihood of returning home or to hospital but was not significantly associated with death. The presence of a pressure ulcer significantly reduced the probability of returning home, but was not associated with a significantly higher risk of death. When the total number of medications, as well as all other variables in the model, were controlled, the use of cardiac medications, antidepressants, and narcotics contributed independently to a higher risk of

dying. Having secondary neurological diagnoses reduced the likelihood of rehospitalization, returning home, and death.

When the analysis was repeated after stratifying by living arrangement prior to hip fracture, the results were different (Tables 4 and 5). For previously noninstitutionalized persons, the model was similar to that of the overall sample, although slightly greater effect sizes were observed for the association between disorientation, cardiac medications, antidepressants, and death, whereas narcotic use

TABLE 4—Polychotomous Logistic Regression Analysis[a] for Previously Institutionalized Persons (n = 989)

Baseline Characteristic	Home		Hospital		Death	
	OR	95% CI	OR	95% CI	OR	95% CI
Age, y						
65–74	1.00	Referent	1.00	Referent	1.00	Referent
74–85	0.73	0.42, 1.26	0.51	0.29, 0.89	0.56	0.16, 1.90
>85	0.44	0.24, 0.79	0.50	0.28, 0.89	1.04	0.32, 3.32
Female sex	0.68	0.41, 1.12	0.61	0.39, 0.97	0.58	0.26, 1.28
Any ADL dependency[b]	0.54	0.35, 0.83	1.40	0.90, 2.19	3.02	1.03, 8.84
Disorientation						
None	1.00	Referent	1.00	Referent	1.00	Referent
Occasional	0.52	0.33, 0.84	1.05	0.65, 1.69	1.62	0.56, 4.73
Disorientation/coma	0.19	0.08, 0.45	0.98	0.55, 1.73	2.53	0.82, 7.78
Able to walk (alone or with help)	0.97	0.64, 1.48	1.14	0.72, 1.80	0.68	0.22, 2.08
Pressure ulcer	0.66	0.36, 1.20	1.01	0.63, 1.62	1.35	0.63, 2.87
No. of medications						
0–3	1.00	Referent	1.00	Referent	1.00	Referent
4–6	0.88	0.56, 1.37	1.33	0.82, 2.14	0.57	0.25, 1.29
≥7	1.33	0.76, 2.32	1.32	0.73, 2.40	0.71	0.27, 1.90
Cardiac medications	0.89	0.58, 1.37	1.32	0.87, 1.99	1.70	0.81, 3.56
Antidepressants	1.26	0.58, 2.75	1.14	0.50, 2.61	1.72	0.36, 8.28
Narcotics	1.75	1.09, 2.81	1.15	0.67, 1.99	1.95	0.79, 4.82
Infectious disease diagnoses	1.29	0.67, 2.49	1.24	0.66, 2.33	1.93	0.73, 5.07
Psychiatric diagnoses	0.51	0.29, 0.91	0.80	0.50, 1.27	0.99	0.46, 2.14
Neurological diagnoses	0.73	0.46, 1.18	0.87	0.57, 1.32	0.68	0.31, 1.48

Note. OR = adjusted odds ratio for 1-month outcome; CI = confidence interval.
[a]"Staying in nursing home" was the referent outcome.
[b]Activities of daily living (ADLs) include bathing, dressing, toileting, transferring, eating/feeding, and grooming.

was no longer significant, probably because of a smaller sample size. For previously institutionalized persons, the association between dependency in activities of daily living and death was stronger. Disorientation did not significantly increase the risk of death; however, it reduced the probability of returning home more for the previously institutionalized than for the previously noninstitutionalized. The ability to walk, alone or with help, did not increase the likelihood of returning to the hospital, as it had for noninstitutionalized persons. The use of cardiac medications or antidepressants was not associated with mortality in the previously institutionalized group; however, the use of narcotics did increase the probability of returning home for persons in this group.

Discussion

One month after admission to a nursing home following hip fracture, 24% of elderly Medicare patients had returned home, 61% were still in the nursing home, 12% had been sent back to the hospital, and 3% had died. The mortality rate in this group was slightly less than the rates of 6% to 12% for all hip fracture patients

reported by others,[10–13] but closer to the 4% annual mortality for nursing home residents reported by Keene.[10] Entry characteristics independently associated with the first transition within 30 days included age, sex, premorbid living arrangement, functional status, orientation, mobility, neurological diagnoses, and the use of cardiac medications, antidepressants, and narcotics. Results for the previously institutionalized group differed in some instances from those for the previously noninstitutionalized. The ability to walk did not increase the likelihood of returning home for the previously institutionalized, as it had for the previously noninstitutionalized, whereas narcotic analgesic use was associated with returning home only in the previously institutionalized. The hypothesis that risk factors associated with different outcomes would overlap was only partially supported by our findings. With the exception of disorientation and dependency in activities of daily living, admission characteristics differed in their association with the four outcomes.

An important feature of our study is the focus on simultaneously considered outcomes in a large sample of residents from multiple nursing homes. Previous

studies of hip fracture patients treated in nursing homes involved relatively small numbers of residents in a limited number of facilities, and the studies focused only on patients' returning home. Our data clearly reveal that this simplification is gained at the expense of precision. Had we focused only on patients' returning home, the contrast between remaining in the nursing home and dying or being rehospitalized would have been lost. Furthermore, combining these outcomes would yield an incorrect estimate of the effect of each independent variable. Consequently, all estimates of the effect of functioning or medical morbidity on given outcomes must be conditioned upon consideration of all the mutually exclusive outcomes.

Previous studies have demonstrated a strong relationship between dependency in activities of daily living and mortality among community-dwelling elders[15] and among persons discharged from nursing homes,[16,17] but to our knowledge this is the first study to describe, by means of multivariate models, the association between functional status and mortality during the first 30 days of nursing home residence. Our finding that functional dependency decreases the probability of returning home has also been reported by others.[5,10] Although we considered functional status at time of admission to the nursing home, rather than prior to fracture, our results were consistent with those of Keene and Anderson.[10] The finding that functional status and the ability to walk had a modest positive effect on rehospitalization as well as on the probability of returning home may imply that these factors not only reflect successful rehabilitation, but also influence the decision to rehospitalize a patient who has an acute decline during rehabilitation.

Disorientation at admission was one of the strongest predictors of mortality, even after other baseline characteristics were controlled. Delirium probably accounts for a significant percentage of residents in this category, since previous work has shown that up to 37% of patients developing delirium in the hospital still have this diagnosis at discharge.[18] The observation that delirium is an important predictor of mortality[12,19,20] may partly reflect the fact that delirium is associated with the presence of significant underlying medical problems. Indeed, an independent effect of delirium on mortality could not be demonstrated in two recent studies that also controlled for illness severity.[18,21] Our finding of an independent effect of

disorientation after controlling for comorbidities and functional status may reflect the medical vulnerability of this condition.

In this study, several diagnoses and medications were associated with 1-month outcomes, possibly serving as comorbidity measures or disease severity measures. For example, neurological secondary diagnoses decreased the probability of all outcomes, and cardiac medications increased both mortality and the likelihood of returning to the hospital. Similarly, the finding that pressure ulcers were associated with a decreased probability of returning home and a trend toward an increase in mortality might be interpreted as simply a reflection of pressure ulcers as markers of underlying medical problems and poor mobility[22]; however, these associations remained after we controlled for functional status, ability to walk, and secondary diagnoses, suggesting an independent effect. Finally, the finding that antidepressant use increased the risk of death more than three times may have arisen because of adverse events associated with the use of antidepressants, such as falls, hip fracture, and cardiac conduction abnormalities,[23] or because the prescribing of these drugs may be selective for those individuals with underlying conditions that are themselves associated with greater mortality. This link would also be a plausible explanation for the strong association between cardiac medication use, narcotic drug use, and mortality.

The unexpected finding that women were less likely than men to be rehospitalized is the first demonstration of an association between sex and hospitalization rates among nursing home residents. The finding that persons with hip fracture who were living with someone prior to fracture were more likely to return home and more likely to be rehospitalized probably reflects the importance of caregiver support at home as well as caregiver advocacy when clinical deterioration occurs.

Our results must be interpreted with consideration of several features. First, this was not a random sample of patients admitted to nursing homes with hip fracture. Second, some of the assessments may be imprecise; however, since the data are collected uniformly and used routinely by the National Health Corporation to assess staffing needs and to improve the efficiency of patient care, these assessments are carefully monitored for accuracy. Since the variables are carefully defined in a coding manual, and since the reliability was high, the chance of misclas-

TABLE 5—Polychotomous Logistic Regression Analysis[a] for Previously Noninstitutionalized Persons (n = 1573)

Baseline Characteristic	Home		Hospital		Death	
	OR	95% CI	OR	95% CI	OR	95% CI
Age, y						
65–74	1.00	Referent	1.00	Referent	1.00	Referent
74–85	0.75	0.53, 1.06	0.58	0.36, 0.94	0.97	0.28, 3.38
>85	0.52	0.36, 0.74	0.54	0.33, 0.88	2.19	0.65, 7.43
Female sex	0.85	0.61, 1.19	0.60	0.40, 0.90	0.56	0.26, 1.19
Living with someone	1.35	1.06, 1.73	1.26	0.88, 1.79	1.15	0.57, 2.30
Any ADL dependency	0.66	0.49, 0.90	1.42	0.96, 2.09	2.02	0.94, 4.37
Disorientation						
None	1.00	Referent	1.00	Referent	1.00	Referent
Occasional	0.74	0.54, 1.02	2.01	1.36, 2.97	3.49	1.58, 7.72
Disorientation/coma	0.44	0.25, 0.73	1.11	0.61, 2.05	4.72	1.84, 12.12
Able to walk (alone or with help)	1.59	1.23, 2.05	1.96	1.35, 2.84	0.88	0.36, 2.16
Pressure ulcer	0.77	0.56, 1.05	1.19	0.82, 1.73	1.40	0.71, 2.75
No. of medications						
0–3	1.00	Referent	1.00	Referent	1.00	Referent
4–6	1.06	0.80, 1.41	1.04	0.69, 1.56	0.59	0.27, 1.30
≥7	1.22	0.84, 1.77	1.56	0.94, 2.58	0.80	0.32, 2.03
Cardiac medications	1.06	0.81, 1.39	1.52	1.05, 2.19	3.19	1.59, 6.42
Antidepressants	1.35	0.79, 2.32	1.02	0.46, 2.31	4.40	1.47, 13.13
Narcotics	0.90	0.66, 1.23	0.94	0.61, 1.45	1.77	0.81, 3.90
Infectious disease diagnoses	0.76	0.43, 1.33	1.29	0.70, 2.39	0.98	0.28, 3.49
Psychiatric diagnoses	0.96	0.66, 1.40	1.07	0.68, 1.67	0.71	0.31, 1.64
Neurological diagnoses	0.64	0.47, 0.87	0.66	0.44, 0.98	0.25	0.10, 0.62

Note. OR = adjusted odds ratio for 1-month outcome; CI = confidence interval.
[a]"Staying in nursing home" was the referent outcome.
[b]Activities of daily living (ADLs) include bathing, dressing, toileting, transferring, eating/feeding, and grooming.

sification was small. Reviewers were always charge-level nurses on the units who were not motivated by corporate incentives such as reimbursement.

Our findings are also limited to patient-related factors, since facility-level variables were either not available or not useful. For example, the use of physical therapy was so homogeneous among hip fracture patients, because of Medicare reimbursement, that we were unable to examine this factor with regard to outcome. Similarly, staffing levels and patient turnover rates were not available. These factors may have made important contributions to the outcomes described.[5]

Despite these limitations, the findings from this study extend the work of previous studies and capitalize on the large database of the National Health Corporation. Furthermore, our findings are more precise because we considered all outcomes simultaneously. Simplifying the analysis by combining outcomes could lead to a misinterpretation of effects. This method of modeling outcomes would be directly applicable to other conditions requiring rehabilitation in the nursing home, such as stroke. Future studies of such conditions may be able to distinguish

patient characteristics that are either generic to rehabilitation in the elderly or disease-specific. □

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