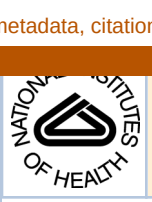

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Amount of Social Contact and Hip Fracture Mortality

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Abstract

OBJECTIVES—To study the association between amount of social contact and mortality after hip fracture in elderly participants.

DESIGN—Prospective cohort.

SETTING—Community residents of Baltimore, Maryland.

PARTICIPANTS—Six hundred seventy-four elderly participants.

MEASUREMENTS—Amount of telephone and direct personal contact between participants and their relatives and friends and mortality up to 2 years after fracture.

RESULTS—No social contact with friends during the 2 weeks before the fracture was associated with a five times greater risk of death over 2 years than daily contact with friends during the 2 weeks before the fracture (hazard ratio (HR) = 5.04, 95% confidence interval (CI) = 2.75–9.23). Participants with less than daily contact were also at greater risk of dying, although the CI spanned 1 (HR = 1.76, 95% CI = 0.99–3.13). Participants who had no contact with family members prefracture were more than twice as likely to die as those who communicated daily during the 2 weeks before fracture (HR = 2.26, 95% CI = 1.36–3.77). Participants who had less than daily contact were also more than twice as likely to die (HR = 2.55, 95% CI = 1.65–3.94).

CONCLUSION—This study suggests that lower social contact before hip fracture is associated with poorer survival after 2 years.

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Keywords

hip fracture; social support; elderly survival

In the United States, more than 340,000 hip fractures occur each year in persons aged 65 and older.[1] A number of studies estimate mortality to be 20% or higher in the first year after hip fracture.[2–7] Risk factors for higher mortality after hip fracture include older age, male sex, associated medical conditions, prefracture functional status, cognitive impairment, and delirium at the time of hospitalization for hip fracture,[2–8] although fracture-related mortality remains high even in persons with no overt comorbidities or physical impairments.[9]

There is evidence that social interaction is associated with better survival in elderly persons,[10–14] even after myocardial infarction or stroke.[15–18] Other evidence suggests that social interaction is associated with better likelihood of functional recovery, which may indirectly improve the prospect of survival,[19–22] but what is not known is whether social interaction is associated with greater survival in frail elderly participants who have suffered hip fracture—a condition associated with high mortality. Because some of the risk factors for fracture differ from those for other conditions, it is important to understand whether social interaction is associated with recovery.

The aim of this study was to evaluate whether frequent social contact is associated with greater likelihood of survival after hip fracture. It is a novel approach to examine the relationship between pre- and postfracture social support and mortality. Also, it extends previous work by examining the association between social network interaction and survival from hip fracture in a large cohort of patients, providing better adjustment for potentially confounding risk factors and by doing so over 2 years after fracture.

METHODS

Participants

Participants in this study were subjects in the second Baltimore Hip Study cohort, which examined changes in physical capacity and quality of life in patients aged 65 and older who were admitted from the community to one of eight Baltimore-area hospitals in 1990 and 1991 for treatment of a new hip fracture (N = 804). Patients admitted from a nursing home or from another institution were excluded from the study, as were those who presented with a pathological fracture (which indicates a different etiology, different risk, and perhaps different protective factors). A more-detailed description of study methods may be found elsewhere.[23]

Of the 804 patients admitted, 674 (83.8%) consented to participate in the prospective study. Within 1 week of the patient's admission to the hospital, a face-to-face interview was conducted using a survey instrument designed to assess the patient's prefracture functional and health status, social contacts, current affective and cognitive status, and demographic characteristics. Patient information was also abstracted from the hospital medical record. Follow-up assessments were conducted on 626 patients (77.9%) 2 months after the hospital admission to ascertain information about physical function, cognitive and affective status, and social contact in the weeks preceding the 2-month interview. If a patient was unable to complete an interview because of cognitive limitations, a proxy respondent—most often the patient's spouse or primary caregiver—was interviewed. Information about frequency of contact—but not about level of satisfaction with contact—was gathered from proxy respondents.

Measures

Amount of Interaction with Social Network—Participants' frequency of interaction with their social network just before hip fracture and 2 months after hip fracture were the explanatory domains of interest.

Three components of the participant's degree of interaction with the social network were assessed: pre- and postfracture frequency of contact with friends and family, satisfaction with the frequency of contact, and the participant's geographic proximity to the social network. Frequency of social contact before fracture was captured as a 6-level categorical variable with responses ranging from more than once a day to never. A summary measure was created by summing the participant's reported number of telephone conversations and visits with siblings, children, other relatives, and friends in the 2 weeks before the fracture. Each participant's satisfaction with the amount of social contact was rated on an ordinal scale ranging from very dissatisfied to very satisfied but was collapsed to two categories—highly satisfied and all other—because of the low number of respondents who were not highly satisfied. Proximity of the social network comprised two specific measures: whether the participant lived alone or with others and whether the participant had other family members living within 1 hour's travel.

The amount of postfracture social contact was calculated in the same way as the amount of prefracture contact. In addition, ordinal measures describing change in the frequency of contact between baseline and 2 months after fracture were created; an increase in the frequency of contact between baseline and 2 months after fracture was categorized as increased contact, a decrease in the frequency of contact was categorized as decreased contact, and no change in contact formed the third category.

Covariates—Information about each participant's age, sex, race, and number and type of comorbidities was obtained from the medical record. Independence in performing lower extremity physical activities of daily living (LPADLs) was assessed using a modified version of the Functional Status Index.[24] LPADLs were measured as a count of the number of activities requiring lower extremity function in which the person required human assistance or did not perform the activity because of health problems before fracture. The 10 functions assessed were walking one block on a level sidewalk; climbing five stairs; rising from an armless chair; putting on pants; putting socks and shoes on both feet; getting in and out of the bath or shower; taking a shower, bath, or sponge bath; getting on and off the toilet; getting into a car; and getting in and out of bed. Depressive symptoms in the hospital were assessed using the 20-item Center for Epidemiologic Study Depression scale (CES-D). Scores range from 0 to 60, with higher scores indicating more depressive symptoms.[25] Assessment of dementia was made according to medical chart note of history of dementia or from the proxy respondent's answers to a set of questions derived from the Blessed Dementia Scale.[26] Proxy responses were available for 458 of the 674 participants (68%). An indication of dementia based on chart review was available for all residents.

An index of each participant's comorbidity on admission to the hospital was created by summing points for each disease condition according to a scheme derived from the Charlson scale. Possible score range was 0 to 15, with higher scores indicating poorer health status. Each participant was also assigned an American Society of Anesthesiologists (ASA) Classification of Physical Status score at the time of the hospitalization for the hip fracture. This score ranged in value from 1 to 5, with 1 indicating a normal, healthy patient and 5 denoting a "moribund patient not expected to survive 24 hours with or without operation."[27] The ASA score was used as an additional comorbidity measure.

Mortality—Information on patient death through 24 months was obtained through periodic interviews and by reviewing death records maintained by the Maryland Bureau of Vital Statistics. Dates of death and hospital admission were used to calculate postfracture survival time.

Statistical Analysis

Cox proportional hazards methods were used to model the association between social network and death while simultaneously controlling for other variables. The number of contacts in the 2-week period before fracture were categorized as 0, 1 to 13, and 14 or more, which approximates daily contact. The number of contacts was summed separately for family and friends. Depressive symptoms data were missing for 236 (35%) participants, BMI data were missing for 167 (25%), and LPADL data were missing for 42 (6%) participants. No attempts were made to impute values for these missing covariates. Selection of variables for the proportional hazards models was based in part on findings from other studies. Potential covariates were also included in the multivariable model if the bivariate association observed in preliminary analyses yielded a *P*-value <.10. Covariates were retained in the multivariable model based on the strength of associations observed in models that included potential confounders. A confounder was defined as a variable that, when added to the model, changed a coefficient for a contact variable by approximately 10%. In the final model, covariates were retained for sex, age, dementia status, ASA score, Charlson comorbidity score, and number of LPADL impairments.

RESULTS

Of the study group, 522 (77.4%) were female, and 624 (92.6%) were white (Table 1). The mean age ± standard deviation of study participants was 81.1 ± 7.4. More than three-quarters of the group had at least one LPADL impairment before fracture. A total of 121 (18.0%) participants had a diagnosis of dementia as indicated on the medical chart (n = 104) or by proxy interview (n = 17).

Table 2 shows the unadjusted relative risk of death during the 2 years after hip fracture according to several patient baseline characteristics. Patients with at least one comorbidity were 1.8 times as likely to die as were patients who had no comorbidities. Participants with more LPADL impairments also had twice the risk of death as those who had no such impairments. Women were about half as likely to die during follow-up as were men. A diagnosis of dementia was associated with greater likelihood of death in a bivariate model. Symptoms of depression as indicated on the CES-D were associated with a slightly greater, but not statistically significant, risk of mortality in the bivariate model but not in the multivariable model. Participants who were aged 85 and older were at higher risk of dying than participants who were aged 65 to 74.

Dementia was also associated with greater likelihood of ADL impairment and comorbidity. Participants with dementia had 8.9 ADL impairments, compared with 6.7 for participants without dementia (*P*<.001), and a comorbidity score of 2.7, compared with 1.5 (*P*<.001).

After adjustment for confounders, participants who had no telephone or personal contact with friends in the 2 weeks before the fracture were five times as likely to die in the follow-up period as were those who saw or spoke with friends 14 times or more (hazard ratio (HR) = 5.04, 95% confidence interval (CI) = 2.75–9.23) (Table 3). Participants who saw or spoke with friends fewer than 14 times during that interval were at a slightly higher risk, although this relationship was of borderline statistical significance at the .05 level (HR = 1.76, 95% CI = 0.99–3.13). Participants who did not see or speak with family members in the 2 weeks before fracture were more than twice as likely to die as were participants who visited or

spoke with family members 14 times or more (HR = 2.26, 95% CI = 1.36–3.77). Similarly, participants who saw or spoke with family members fewer than 14 times were more than twice as likely to die as those who spoke with them more (HR = 2.55, 95% CI = 1.65–3.94).

Participants for whom the study relied on proxy responses were older than participants who were able to provide their own responses (83.0 vs. 80.2, $P<.001$). These participants also had a greater number of LPADL impairments on average (2.6 vs. 1.0, $P<.001$) and more severe comorbid conditions (2.2 vs 1.7, $P<.001$). Similar results were observed for nonrespondents to other questions.

DISCUSSION

It was found that elderly persons who have infrequent contact with family or friends before hip fracture are at higher risk of dying than are those who have frequent contact. A dose-response relationship was observed between the amount of social contact with friends before fracture and the risk of dying. A strong dose-response relationship was not observed between the amount of family contact and the risk of death.

The observation that infrequent contact is associated with higher mortality is consistent with observations reported in a large number of studies.[14,18,28] It is possible that frequency of communication is a marker for health. When three measures of health and physical function were included as well as dementia status as covariates, meaningful changes were not observed in the magnitude of the association between frequency of contact with friends and mortality, although a change in the association between frequency of contact with family and mortality was observed. It is possible that family contact is more intertwined with the patient's health status than is contact with friends. In support of this conclusion, fewer patients had contact with friends after the fracture than before the fracture. This may reflect the fact that contact with friends as one ages is more dependent on mobility and reciprocity than at younger ages. There have been few studies that have examined the differential and interrelated support provided by family and friends, and this study provides data toward that end. This is an observation that merits further study.

The absence of a relationship between the depressive symptom score and mortality in the multivariable model is also somewhat surprising. This may have resulted from the fact that measures of depressive symptoms were missing for 35% of the participants, which is a limitation of the present study. Another limitation of this study was the absence of other data to evaluate changes in health status after hip fracture that might have affected the relationship between participants and their social networks. By limiting the examination to 2 years (which is the duration over which mortality was followed), this concern is somewhat lessened. Another limitation of this study was the use of proxy respondents. The presence of a proxy implies some level of social contact. This increased the proportion of the sample that had social contact, although because the main focus of the analysis was the association between the amount of social contact and mortality, it is unlikely that increasing the sample in this way influenced the resultant findings. Recall bias is another potential limitation. The amount of postfracture social contact may have influenced participants' recall of prefracture social contact. Therefore, the measure of social contact should not be attributed too precisely to any time period. The use of proxy respondents, who may not have been able to accurately assess the amount of prefracture social contact, may have led to a nondifferential misclassification and an underestimate of the true association between social contact and survival.

The finding of no significant association between dementia and mortality in adjusted models may be due to the fact that participants with dementia were more likely to have LPADL

limitations and comorbidities than were participants who did not have dementia. Self-report of the amount and type of social interaction by participants with dementia may also lead to undermeasurement of the association between social interaction and mortality. Another limitation is the reliance on medical records and proxy interview for the assessment of dementia. This may have also led to undermeasurement of the true association if medical records and proxy assessment led to an underreporting of dementia. It is also possible that the low prevalence of dementia in the study subjects reflects a selective sample of more cognitively intact hip fracture patients. For this reason, the findings might not be generalizable to patients with cognitive impairment.

The study included hip fracture patients who were admitted from the community to one of eight Baltimore-area hospitals in 1990 and 1991. The cohort included approximately half of all hip fracture patients treated in Baltimore during the period of the study. These patients are likely to be similar to hip fracture patients elsewhere, although conclusions should not be extended to patients being admitted from nursing homes or from other institutions. Those patients are likely to be frailer and less cognitively intact than the participants included in this study.

This study had several strengths. It included measures of the amount of social contact that participants experienced before fracture and at 2 months after fracture. It also differentiated between the amount of social contact that occurred between participants and their friends and the amount that occurred with relatives. Furthermore, this study was the first of which the authors are aware that provides information about the relationship between both pre- and postfracture social support and mortality for a large group of hip fracture patients.

These findings are consistent with those reported in a number of studies that found a relationship between social contact and survival in older persons, but it extends previous work by exploring differences between different types of relationships.

This study did not directly address several intriguing questions. Of primary importance is the precise nature of support provided by friends and family and how they might differ. This study provides indirect evidence that family and friends may have different roles in ameliorating the effects of hip fracture. It provides evidence that social isolation from friends, in particular, may be associated with particularly high levels of mortality.

This study does not provide definitive answers about the importance of social support to survival after hip fracture but does suggest that social support is strongly related to survival. Future studies that more precisely distinguish between the roles of family and friends and between social support that preceded and followed hip fracture may help explain this observation. In the meantime, it seems prudent for clinicians to be aware of hip fracture patients' social support networks in establishing posthospital care regimens for their patients. Patients without extensive family and friend support may require more formal, instrumental support from home health or social service agencies than patients with extensive family support.

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Table 1

Study Participants: Descriptive Statistics (N = 674)

Variable	Value
Age, mean ± SD	81.1 ± 7.4
Female, %	77.4
Married, %	29.4
BMI, mean ± SD *	22.4 ± 4.3
White, %	92.6
Number of LPADL impairments, mean ± SD *	1.5 ± 1.4
Mortality at 24 months, %	25.3
Comorbidity score, %	
≥4	15.6
3	15.3
2	18.7
1	28.8
0	21.7
Number of formal supports, %	
≥3	9.9
2	8.2
1	18.5
0	64.4
Presence of moderate to severe depressive symptoms (Center for Epidemiologic Studies Depression Scale >20) *	34.2
History of, %	
Dementia	18.0
Chronic obstructive pulmonary disorder	17.8
Cancer	14.2
Congestive heart failure	13.6
Diabetes mellitus	11.8
Myocardial infarction	11.7
Stroke	10.6
Peripheral vascular disease or deep vein thrombosis	8.1
Ulcer	5.7
Cirrhosis or alcohol abuse	5.6
Rheumatoid arthritis or lupus	3.0

Note: All data other than mortality at 2 years relate to the prefracture period or study onset.

* Because of missing data, the sample sizes for body mass index (BMI), lower extremity physical activity of daily living (LPADL) impairment, and depressive symptoms were 507, 632, and 438, respectively.

SD = standard deviation.

Table 2

Vital Status According to Patient Prefracture Characteristics (N = 674)

Variable	Died within 2 Years, n (%)	Relative Risk of Death, 2 Years (95% Confidence Interval)	Chi-Square *P*-Value
Age			
≥85	72 (30.5)	1.59 (1.06–2.38)	.06
75–84	70 (23.3)	1.13 (0.76–1.67)	
65–74	27 (20.6)	1.0 (ref)	
Sex			
Female	105 (20.4)	0.48 (0.37–.62)	.001
Male	64 (42.4)	1.0 (ref)	
Race			
White	156 (25.3)	0.97 (0.60–1.58)	.91
Nonwhite	13 (26.0)	1.0 (ref)	
BMI *			
≤27	154 (25.7)	1.07 (0.66–1.72)	.56
≥27	15 (22.4)	1.0 (ref)	
Number of LPADL impairments			
≥3	53 (40.2)	2.40 (1.76–3.27)	
1 or 2	44 (32.4)	1.93 (1.38–2.70)	.001
0	60 (16.8)	1.0 (ref)	
Dementia status			
Diagnosis	49 (41.2)	1.88 (1.44–2.45)	.001
No diagnosis	120 (21.9)	1.0 (ref)	
Presence of depressive symptoms (n = 438)			
Yes	35 (23.6)	1.32 (0.90–1.94)	.16
No	51 (17.9)	1.0 (ref)	
Number of formal supports			
≥3	19 (31.7)	1.39 (0.92–2.09)	.23
2	15 (27.3)	1.19 (0.75–1.90)	
1	37 (30.1)	1.32 (0.96–1.82)	
0	98 (22.8)	1.0 (ref)	
Married			.37
Yes	54 (27.7)	1.05 (0.95–1.16)	
No	115 (24.4)	1.0 (ref)	
Comorbidity index score			
≥4	48 (46.6)	4.50 (2.67–7.59)	.001
3	33 (32.0)	3.10 (1.78–5.40)	
2	37 (30.1)	2.91 (1.68–5.04)	

Variable	Died within 2 Years, n (%)	Relative Risk of Death, 2 Years (95% Confidence Interval)	Chi-Square *P*-Value
1	36 (18.7)	1.80 (1.03–3.16)	
0	15 (10.3)	1.0 (ref)	
Anesthesiologist's risk rating			
4	25 (3.7)	4.78 (2.91–7.82)	
3	114 (16.9)	2.56 (1.65–4.04)	.001
1–2	20 (3.0)	1.0 (ref)	

*Because of missing data, the sample sizes for body mass index (BMI), lower extremity physical activity of daily living (LPADL) impairment, and depressive symptoms were 507, 632, and 438, respectively.

Table 3

Association Between Prefracture Measures of Social Support and 2-Year Mortality After Hip Fracture (N = 674)

Variable	Died within 2 Years, n (%)	Unadjusted Hazard Ratio (95% Confidence Interval)	Adjusted † Hazard Ratio (95% Confidence Interval)
Number of social contacts in 2 weeks:			
With friends			
0	74 (39.2)	4.85 (2.79–8.44) ***	5.04 (2.75–9.23) ***
1–13	153 (20.3)	2.12 (1.23–3.66) ***	1.76 (0.99–3.13) *
≥14	221 (10.0)	1.0 (Referent)	1.0 (Referent)
With family			
0	129 (41.1)	4.05 (2.63–6.23) ***	2.26 (1.36–3.77) ***
1–13	200 (31.5)	2.78 (1.83–4.23) ***	2.55 (1.65–3.94) ***
≥14	266 (12.8)	1.0 (Referent)	1.0 (Referent)
Satisfaction with amount of contact			
With friends			
Highly satisfied	310 (14.5)	0.61 (0.37–0.99) **	0.68 (0.41–1.14)
All other	109 (22.9)	1.0 (Referent)	1.0 (Referent)
With family			
Highly satisfied	262 (14.1)	0.71 (0.42–1.21)	0.75 (0.42–1.34)
All other	112 (18.8)	1.0 (Referent)	1.0 (Referent)
Proximity of social network:			
Others in household?			
Yes	366 (31.7)	2.14 (1.50–3.03) **	1.56 (0.99–2.46) *
No	261 (16.5)	1.0 (Referent)	1.0 (Referent)
Immediate family living within 1 hour?			
Yes	393 (25.2)	0.80 (0.48–1.33)	1.21 (0.57–2.56)
No	58 (29.3)	1.0 (Referent)	1.0 (Referent)

* $P < .10$;

** .05;

*** .01.

† Hazard ratio for the category relative to its reference category adjusted for sex, age, anesthesiologist's risk rating, comorbidity score, dementia status, and number of lower extremity physical activity of daily living impairments.