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Elder Self-Neglect and Hospitalization: Findings from the Chicago Health and Aging Project

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Abstract

Objectives—The objective of this study is to quantify the relation between reported elder self-neglect and rate of hospitalization in a community population of older adults.

Design—Prospective population-based study

Setting—Geographically-defined community in Chicago.

Participants—Community-dwelling older adults who participated in the Chicago Health and Aging Project. Of the 6,864 participants in the Chicago Health and Aging Project, a subset of 1,165 participants was reported to social services agency for suspected elder self-neglect.

Measurements—The primary predictor was elder self-neglect reported to social services agency. Outcome of interest was the annual rate of hospitalization obtained from the Center for Medicare and Medicaid System. Poisson regression models were used to assess these longitudinal relationships.

Results—The average annual rate of hospitalization for those without elder self-neglect was 0.6 (1.3) and for those with reported elder self-neglect was 1.8 (3.2). After adjusting for sociodemographic, socioeconomic, medical commorbidities, cognitive function and physical function, elders who self-neglect had significantly higher rate of hospital utilization (RR, 1.47, 95% CI, 1.39–1.55). Greater self-neglect severity (Mild: PE=0.24, SE=0.05, $p<0.001$; Moderate: PE=0.45, SE=0.03, $p<0.001$; Severe: PE=0.54, SE=0.11, $p<0.001$) were associated with increased annual rates of hospital utilization, after considering same confounders. Interaction term analyses suggest that the significant relationship between self-neglect and hospitalization was not mediated through medical conditions, cognitive impairment and physical disability.

Conclusion—Reported elder self-neglect was associated with increased rates of hospitalization in this community population. Greater self-neglect severity was associated with a greater increase in the rate of hospitalization.

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Drs. Dong, Simon, and Evans were responsible for the conception and design as well as analysis and interpretation of data. All these authors were involved in the drafting of the manuscript, critical revision of the manuscript and statistical analysis of the manuscript.

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Keywords

elder self-neglect; health services utilization; population-based study

INTRODUCTION

Elder self-neglect is an important public health issue and is the most common form of elder abuse and neglect reported to social services agencies. Although there is a great paucity in our current understanding of prevalence of self-neglect in the community setting, prior prevalence studies of elder abuse and neglect have varied from 5% to 30%, depend on the survey methodology and population studied (1–6). Recent studies suggest the prevalence of elder abuse and neglect is about 10–15% (7–10). Evidence suggest that reports of self-neglect to social services agencies are rising (11). In addition, self-neglect is associated with increased risk of mortality, and there is a gradient relationship between higher self-neglect severity and greater risk for mortality (12–14). Moreover, self-neglect has great relevance not only to health care professional and social services agency, but also to public health professionals, legal professionals, community organizations and other relevant disciplines.

The National Centers on Elder Abuse defines elder self-neglect as "…as the behavior of an elderly person that threatens his/her own health and safety. Self-neglect generally manifests itself in an older person as a refusal or failure to provide himself/herself with adequate food, water, clothing, shelter, personal hygiene, medication (when indicated), and safety precautions" (15). Prior studies by Dyer et al have lead to significant improved understanding of the self-neglect phenomenon as well as it specific phenotypes in community populations(16;17). At the same time, these self-neglecting behaviors could lead to increased use of outpatient, emergency, or hospitalizations services, which will likely place additional burden on the existing health care systems(18). However, there remain gaps in our understanding in the health services utilizations among those who self-neglect.

Hospitalization contributes greatly to the increasing cost in our current health care system. Despite the scientific advances over the last century and our increased ability to develop preventive services and disease prevention strategies, many hospitalizations could be prevented. This could be especially the case for older adults who self-neglect and often manifest in behaviors that threatens their health and safety, which further predisposes their likelihood to have more encounters with the health care systems. Prior case reports suggest frequent health services utilization among those identified as self-neglectors (19;20). Recent epidemiological studies have provided conflicting results in health services utilizations among self-neglectors after being identified by the social services agency (18;21;22).

At the same time, most previous studies have categorized self-neglect dichotomously as "self-neglect" or "no self-neglect". However, self-neglect, like many other geriatric syndromes, occurs along a continuum, rather than in two discrete categories (23). Evidences suggests that improved understanding of the full spectrum of self-neglect is just as important, and that there is a gradient association between the greater self-neglect severity and morbidity and mortality (12;13). However, we are not aware of any study that has systematically quantified the relations between the spectrum of self-neglect severity and hospitalization in the community-dwelling populations.

Our overall objectives in this report are to quantify: 1) the relationship between reported self-neglect and the rate of hospitalization within a prospective population-based study; and 2) the relationship between the continuum of self-neglect severity and hospitalization in the same population. We hypothesized that older adults with reported self-neglect have

increased rates of hospitalization, and that there is a gradient relationship between greater self-neglect severity and higher rate of hospitalization.

However, we are not aware of any epidemiological study that has examined the longitudinal association between self-neglect and rate of hospitalization in community-dwelling population. Filling this gap will contribute the current paucity in our understanding of the consequences of self-neglect and will be critical to educate the public on the consequences of self-neglect and provide data that could inform practice and policy at the local, state and national level.

METHODS

Setting

Chicago Health and Aging Project (CHAP), a study begun in 1993, examines risk factors for Alzheimer's disease. Its participants include residents of three adjacent neighborhoods on the south side of Chicago. More in depth details of the study design of CHAP have been previously published (24;25). Briefly, the study enrolled residents aged 65 years and older of three adjacent neighborhoods on the south side of Chicago. In 1993, the study began with a complete census of the community area. The census identified 7,813 age-eligible residents, 6,158 (78.9%) of whom were enrolled between 1993 and 1997. In 2000, CHAP began to enroll successive cohorts of participants from the study community who had turned 65 since inception of the study. Data collection occurs in three-year cycles, with each follow-up cycle beginning after the conclusion of the previous cycle. Follow-up participation rate averaged 80–85% of survivors at each cycle. Each data-collection cycle includes an in-person interview conducted in the participants' homes. The interviews include standardized questionnaires and tests for the assessment of health history, and environmental observations.

Participants

This study included participant who were enrolled between 1993 and 2005 and had data on hospitalization history (N=6,864) obtained from the Center for Medicare and Medicaid Services. From this cohort, we identified 1165 participants who were reported to social services agency for suspected elder self-neglect from 1993 to 2005. These 1,165 participants were subset of the total cohort of 6864 participants. Suspected cases of elder self-neglect were reported by friends, neighbors, family, social workers, city workers, health care professionals, and others. The reports were usually initiated based on the concerns for the health and safety for the older adult, which in turn would initiate a wide array of social and legal services to help them. CHAP and social services data were matched using variables of date of birth, gender, race, home telephone number and exact home address. All CHAP participants received structured, standardized in-person interviews that included assessment of health history. Written informed consent was obtained, and the study was approved by the Institutional Review Board at Rush University Medical Center.

Reporting and Assessment of Self-Neglect

Elder self-neglect in this study was based on all suspected cases reported to social services agency. When a case was reported, a caseworker performed a home assessment, which rates the unmet needs in the domains of personal hygiene and grooming, household and environmental hazards, health needs and overall home safety concerns. A total of 15 items were used to rate the degree of unmet needs and each items were scored on the scale of 0 to 3, with higher number indicating greater danger to health and safety. The level of severity was rated by case workers based on their concerns for the client's personal health and safety, with the maximum cumulative score of 45. Confirmed self-neglect in this study was defined

as anyone with a score of 1 or greater (N=913) which are a subset of the reported cases of self-neglect to social services agency. Elder self-neglect severity refers to the scores 1 to 45, with higher scores within this range indicating greater levels of elder self-neglect severity. The details of this measure has been previously described (26–31). Available information from the social services agency internal report (32) showed that this measure had inter-rater reliability coefficients great than 0.70 and the internal consistencies were high with Cronbach's alpha of 0.95 (28). Both face and content validity were evaluated using qualitative data from case managers and agency administrators. In addition, external validity of the measure was assessed and shown to predict increased risk of premature mortality (12).

Hospitalization

Hospitalization records were abstracted from the Medicare Standard Analytic Files (SAFs) obtained from the Centers for Medicare and Medicaid Services (CMS). CMS has approved the Study Protocol and Data Use Agreement with the CHAP study to obtain CMS data. CHAP study has successfully linked participants and their CMS claims data for the Medical Denominator Files and the SAF files which contains the record of hospitalization. For each participant, we have abstracted and summarized SAF files on their number of hospitalization after the identification of self-neglect to the last available CMS data in December 2007.

Covariates

Demographic variables include age (in years), gender (men or women), race (self-reported: non-Hispanic black versus non-Hispanic white), education (years of education completed), and income categories (1=$0–4,999; 2=$5,000–9,999; 3=$10,000–14,999; 4=$15,000–19,999; 5=$20,000–24,999; 6=$25,000–29,999; 7=$30,000–34,999; 8=$35,000–49,999; 9=$50,000–74,999; 10=$75,000 and over).. The parent CHAP study also collected self-reported medical conditions of hypertension, diabetes mellitus, stroke, coronary artery disease, hip fracture, and cancer.

A battery of four cognitive function tests was administered: the Mini-Mental State Examination (MMSE) (33), immediate and delayed recall of brief stories in the East Boston Memory Test (34) and the Symbol Digit Modalities Test (35). To assess global cognitive function with minimal floor and ceiling artifacts, we constructed a summary measure for global cognition based on all 4 tests. Individual test scores were summarized by first transforming a person's score on each individual test to a z-score, which was based on the mean and standard deviation of the distribution of the scores of all participants on that test, and then averaging z scores across tests to yield a composite score for global cognitive function. This procedure has the advantage of increasing power by reducing random variability present within tests, as well as reducing floor and ceiling effects of particular tests. In addition, it produces a composite score that is approximately normally distributed.

Physical function was assessed using the Katz Index of Activities of Daily Living (Katz ADL), which measured limitations in an individual's ability to perform basic self-care tasks(36). Physical function was also assessed by direct performance testing, which provided a comprehensive objective and detailed assessment of certain abilities. Lower-extremity performance tests consisted of measures of tandem stand, timed walk, tandem walk, and ability to rise to a standing position from a chair. The tests requiring walking performance were quantified in terms of both the number of seconds to complete the task. Other tests were measured in terms of the number of trials completed within a specified time period. Most of these performance tests were used in the Established Populations for Epidemiologic Studies of the Elderly (EPESE) project (37) and in other large-scale studies of disability. Summary measures of these above tests were created as physical performance test scores.

Lower score indicate impairment in these above activities and tasks which are often needed for independent living and may contribute toward physical disability.

Analytic Approach

Univariate analyses were provided for the reported and no reported self-neglect groups across the age, gender, race, education, income, medical commorbidities, and levels of cognitive function and physical function. Our independent variables of interest were reported self-neglect, confirmed self-neglect, and self-neglect severity. Our outcome of interest was annual rate of hospitalization. In addition, we calculated the annual rate of hospitalization for the different severities of elder self-neglect (Mild = score of 1–15; Moderate = score of 16–30; and Severe = score of 31–45). We used t-test or F-test to compare differences in the rate of hospitalization between groups.

Poisson regression models were used to quantify the relation between elder self-neglect and rate of hospitalization. Given the participants were recruited at different time point throughout the CHAP study, a log (time) variables were used in all models. We used a series of models to consider these relationships, taking into consideration the potential confounders. In our core model (Model A), we included age, gender, race, education, and income to quantify the association of elder self-neglect and hospitalization outcomes. In addition, we added to the prior model common medical comorbidities of hypertension, coronary artery disease, stroke, hip fracture, cancer, and diabetes (Model B). Next we added to the prior model the levels of cognitive function (Model C). Finally, models were repeated controlling for additional physical function measures (Model D). We also repeated the prior models A–D to examine the association between confirmed elder self-neglect and rate of hospitalization.

Then, we examined the relationship between full spectrum of elder self-neglect severity as a continuous variable and rate of hospitalization by repeating Models A–D. Moreover, we repeated these models for levels of self-neglect severity (Mild = 1–15; Moderate = 16–30; and Severe = 31–45) and rate of hospitalization. Lastly, we conducted interaction term analyses for the same models to examine the effect of health-related factors and self-neglect, with respect to the rate of hospitalizations (i.e., medical conditions × self-neglect, cognitive function × self-neglect and physical function × self-neglect). Rate Ratio (RR), 95% Confidence Interval (CI), Standardized-Parameter Estimates (PE), Standard Error (SE) and P values were reported for the regression models. Analyses were carried out using SAS®, Version 9.2 (SAS Institute Inc., Cary, NC).

RESULTS

Baseline Characteristics

Of the 6,864 CHAP participants in this study, a subset of 1,165 participants were identified by social services agency for suspected elder self-neglect from 1993 to 2005. The mean age of those with self-neglect was 78.3 years (standard deviation [SD] = 7.9 years) and those without self-neglect was 72.8 (6.7). The annual rate of hospitalization for those without self-neglect was 0.55 (1.26) and for those with reported elder self-neglect was 1.79 (3.24) (t-test, 21.76, $p<0.001$) (Table 1). Similar results were found for confirmed self-neglect. In addition, the study found a gradient increase in the levels of self-neglect severity and hospitalization. The annual rate of hospitalization utilization for mild self-neglect was 1.67 (3.66), for moderate self-neglect was 1.95 (3.24) and for severe self-neglect was 2.72 (3.98) (F-test, 4.60, $p<0.001$). Approximately 33% of participants did not have any hospitalization, 39% of participants had 1 or 2 hospitalizations, and 38% of the participants had 3 or more hospitalizations.

Elder Self-Neglect and Rate of hospitalization

In the initial Poisson regression model adjusting for age, gender, race, education and income, we found that reported elder self-neglect independently predicted the increased rate of hospitalization (RR, 1.93, 95%CI, 1.84–2.03) (Table 2, Model A). After adding common chronic medical conditions of hypertension, diabetes, stroke, cancer, thyroid disease, and myocardial infarction to the model (Model B), the association diminished slightly (RR, 1.65, 95%CI, 1.56–1.74). Next, we added cognitive function to the prior model and the association did not change (Model C). In the last model (Model D), after adjusting for physical function measures, reported elder self-neglect remained an independent predictor of increased rate of hospitalization (RR, 1.47, 95%CI, 1.39–1.55). For confirmed elder self-neglect, the associations were similar (Table 2).

Elder Self-Neglect Severity and Hospitalization

To quantify the relation between elder self-neglect severity and hospitalization, an initial Poisson regression model adjusting for age, gender, race, education and income was created with hospitalization utilization as the outcome (Model A). The coefficient representing the association of every point increase in self-neglect severity score and hospitalization was 0.02 (SE, 0.05, RR, 1.02, 95% CI, 1.02–1.03, $p<0.001$), suggesting a statistically significant gradient association between greater severities of elder self-neglect and increased rates of hospitalization. After adding chronic medical conditions of hypertension, diabetes, stroke, cancer, thyroid disease, and coronary artery disease to the model (Model B), the association remained statistically significant. In the next model (Model C), addition of cognitive function did not change the prior associations. In the last model (Model D), after adding physical function measures to prior model, the coefficient changed minimally and remained statistically significant (PE = 0.02, SE, 0.01, RR, 1.02, 95% CI, 1.01–1.02, $p<0.001$). Figure 1 graphically represents greater self-neglect severity (range 1–45) and rate of hospitalization in the fully-adjusted model.

We quantified the relation between categorically defined levels of self-neglect severity and rate of hospitalization (Table 3).In the core model (Model A), mild self-neglect (PE, 0.43, SE, 0.05, RR, 1.54, 95% CI, 1.39–1.69, $p<0.001$), moderate self-neglect (PE, 0.77, SE, 0.03, RR, 2.15, 95% CI, 2.03–2.28, $p<0.001$) and severe self-neglect (PE, 0.92, SE, 0.11, RR, 2.50, 95% CI, 2.05–3.06, $p<0.001$) were all independent associated with the increased rate of hospitalization. In models B and C, addition of chronic medical conditions and cognitive function did not significantly change the associations between self-neglect severity and rate of hospitalization. In the fully-adjusted model (Model D), mild self-neglect (PE, 0.24, SE, 0.05, RR, 1.28, 95%, 1.16–1.41, $p<0.001$), moderate self-neglect (PE, 0.45, SE, 0.03, RR, 1.57, 95% CI, 1.48–1.67, $p<0.001$) and severe self-neglect (PE, 0.54, SE, 0.11, RR, 1.72, 95% CI, 1.39–2.12, $p<0.001$) were all independent associated with the increased rate of hospitalization.

Interaction Term Analyses between Self-Neglect and Health-Related Factors

Lastly, we examine the interaction effect of self-neglect with health related factors with respect to the rate of hospitalization (Table 4). For medical conditions, interaction term (medical conditions × self-neglect) was not statistically significant, suggesting medical conditions did not modify the relationship between self-neglect and rate of hospitalization. Similar results were found for interaction term analyses for cognitive function and physical function and self-neglect with respect to the rate of hospitalization outcomes.

DISCUSSION

We found that reported and confirmed elder self-neglect independently associated with the increased risk of hospitalization. In addition, greater severity of elder self-neglect was associated with the greater risk of hospitalization. Moreover, the significant relationship between self-neglect and hospitalization was not mediated through the presence of medical comorbidities, cognitive impairment and physical disability.

Prior study has matched the Connecticut Social Services Agency data to the Established Populations for the Epidemiologic Studies in the Elderly (EPESE) to identify the 120 cases of self-neglect. In this study (22), confirmed elder self-neglect was associated with increased risk of nursing home placement in this cohort. Other study has indicated that older adults who have encounters with Adult Protective Services agencies have greater utilization of behavioral health services (38). However, a recent retrospective case-control study of 131 self-neglect cases found no significant differences in health care utilizations compared the matched controls (21).

Our findings build on the results of prior studies and contribute to the field of elder self-neglect and adverse health outcomes. First, our study systematically examined the prospective association between self-neglect and rate of hospitalization; demonstrating a significant association between elder self-neglect increased rate of hospitalization. The study population is socio-demographically and socioeconomically diverse and has been well characterized for more than 15 years, which contribute toward the generalizability in community populations of older adults.

Second, our study considered the wide range of potential confounders in the relationship between elder self-neglect and rate of hospitalization. Older age, lower levels of socioeconomic status, more medical commorbidities, and lower levels of cognitive and physical health have been associated with increased risk for health services utilization. However, adjusting for these factors did not significantly reduce the significant relationship between self-neglect and rate of hospitalization.

Third, our study examined the full spectrum of elder self-neglect as a continuum with respect to rate of hospitalization, rather than strictly categorically defined self-neglect. Our study findings contribute to the apparent linear gradient associations between self-neglect severity and rate of hospitalization. This information provides an important step to the better understanding of the potential causal association between self-neglect and health services utilization. With recent biomedical and technological advances, it is critical for professionals, social services agencies and other relevant disciplines to identify older adults at risk for self-neglect and intervene before self-neglecting behaviors become more severe, which might then warrant hospitalization. Improved understanding of factors that increases hospitalization and then devise targeted intervention, could also have significant implications for practice and policy

The temporal relations between elder self-neglect and hospitalization needs further investigation. We considered a series of sociodemographic, socioeconomic characteristic, medical commorbidities, cognitive function, and physical function. However, adjustments for these factors did not significant the relationship between self-neglect and rate of hospitalization. Metabolic abnormalities, nutritional deficiencies, infections, injuries or trauma may be other factors that account for the association between elder self-neglect and rate of hospitalization, but these factors were not considered in this analysis. Severity of medical commorbidities could another important factor in determining the causal mechanisms between self-neglect and hospitalization. It is conceivable that self-neglect could exacerbate the existing medical conditions which could predispose a higher rate of

hospitalization. However, we do not have measures in our existing data to further elucidate these relations.

Our study also has limitations. First, ascertainment of hospitalization may not be complete. A limitation of using CMS data is selective under-detection of some services including use of Veterans Administration facilities and some managed care episodes. This under-detection of our outcomes of interest tends to underestimate the strength of association between self-neglect and hospitalization. Second, this study could not examine the relation between specific indicators/behaviors of self-neglect and rate of hospitalization, as the precise understanding of self-neglect phenotypes (i.e., environmental neglect vs. personal hygiene, etc) could improve our understanding of the causal mechanism. Future studies are needed to elucidate the relation between specific phenotypes of elder self-neglect and hospitalization.

Fourth, our study does not have available data on other relevant health services utilization measures (i.e., outpatient clinic visit, home health visit, or nursing home placement, etc). This information could help to explain the causal mechanisms between self-neglect and hospitalization. Future studies of these relations deserve further exploration. Fifth, we do have information on the client's social support system or the social context of the self-neglecting behaviors that might exacerbate the risk of hospitalization. Future studies are needed to examine these relations.

Sixth, there are likely to be additional factors that may account for the increased hospitalization (substance abuse, infection, injury/trauma, and etc). In addition, improved understanding of impact of self-neglect on the severities of chronic medical conditions could contribute toward the causal mechanisms between self-neglect and rate of hospitalization. Seventh, we have neither data on Medicaid status or duo-eligible status of the participants, nor data on the specific types and reasons for hospitalization or the potential differential use of intensive care unit for those who self-neglect. This data could be important to consider as additional confounders or mediators in our analyses, which may in-part account for the findings in this report. However, this study sets the foundation for future study of self-neglect to systematically examine these issues in representative populations.

Our findings have significant clinical implications in the prevention, detection, and management of elder self-neglect. Medical professionals should consider routine screening for self-neglect among older patients who may have frequent encounters with hospitals. Medical professionals should also be educated on the importance of screening self-neglect and could be integrated into the routine history taking for older patients in clinical settings. Close monitoring of older adults who self-neglect could help clinicians to more closely monitor the patients and set the basis for future intervention study to examine the effectiveness of screening for self-neglect in the community population. Our findings could have important implications not only for geriatricians, but also across multiple disciplines, which work with older adults with self-neglect. Other relevant medical disciplines, legal professionals, nursing, social workers, social services agencies who work with elders who self-neglect or who are at risk for self-neglect, could be in unique positions to identify and intervene on predisposing factors that might increase the unnecessary hospitalizations. Our finding has implications for legal and law enforcement professionals, especially relating to guardianship proceedings for older adults who have the most severe form of self-neglecting behaviors.

In addition, it is important for all relevant disciplines to monitor the severity or the progression of self-neglecting behaviors in older adults. Early identification of milder forms of self-neglect and devising targeted prevention and intervention strategies, could prevent deterioration of self-neglect into more severe forms, which in turn could potentially decrease

the unnecessary hospitalization. Vigorous monitoring and betters understanding of factors that might aggravate self-neglect to greater severity could also help clinicians to work closely with concerned family members, social workers, legal professionals, health professionals, and public health and community organizations to create a multi-disciplinary approach to care for this vulnerable population.

Future research is needed to explore temporal associations of targeted risk/protective factors associated with self-neglect in community-dwelling populations (39). Future studies are needed to explore the longitudinal association between self-neglect to the rate as well as the intensity of other forms of health services utilization (outpatient utilization, nursing home placement, etc). Future studies are needed to examine the effectiveness of current prevention and intervention strategies for elder self-neglect with respect to health services utilization outcomes in community populations. Future studies are needed to explore the racial/ethnic differences in elder self-neglect and health services utilization in socioeconomically diverse populations (40).

Conclusion

In sum, reported elder self-neglect is independently associated with an increased annual rate of hospitalization in a community-dwelling population of older adults. In addition, there is a linear association between greater self-neglect severity and higher rates of hospitalization. Future longitudinal investigations are needed to examine the temporal relations between specific self-neglect behaviors and various form of health services utilization. Future studies are needed to systematically quantify the temporal relations between self-neglect and health services utilizations across different sociodemographic and socioeconomic subgroups.

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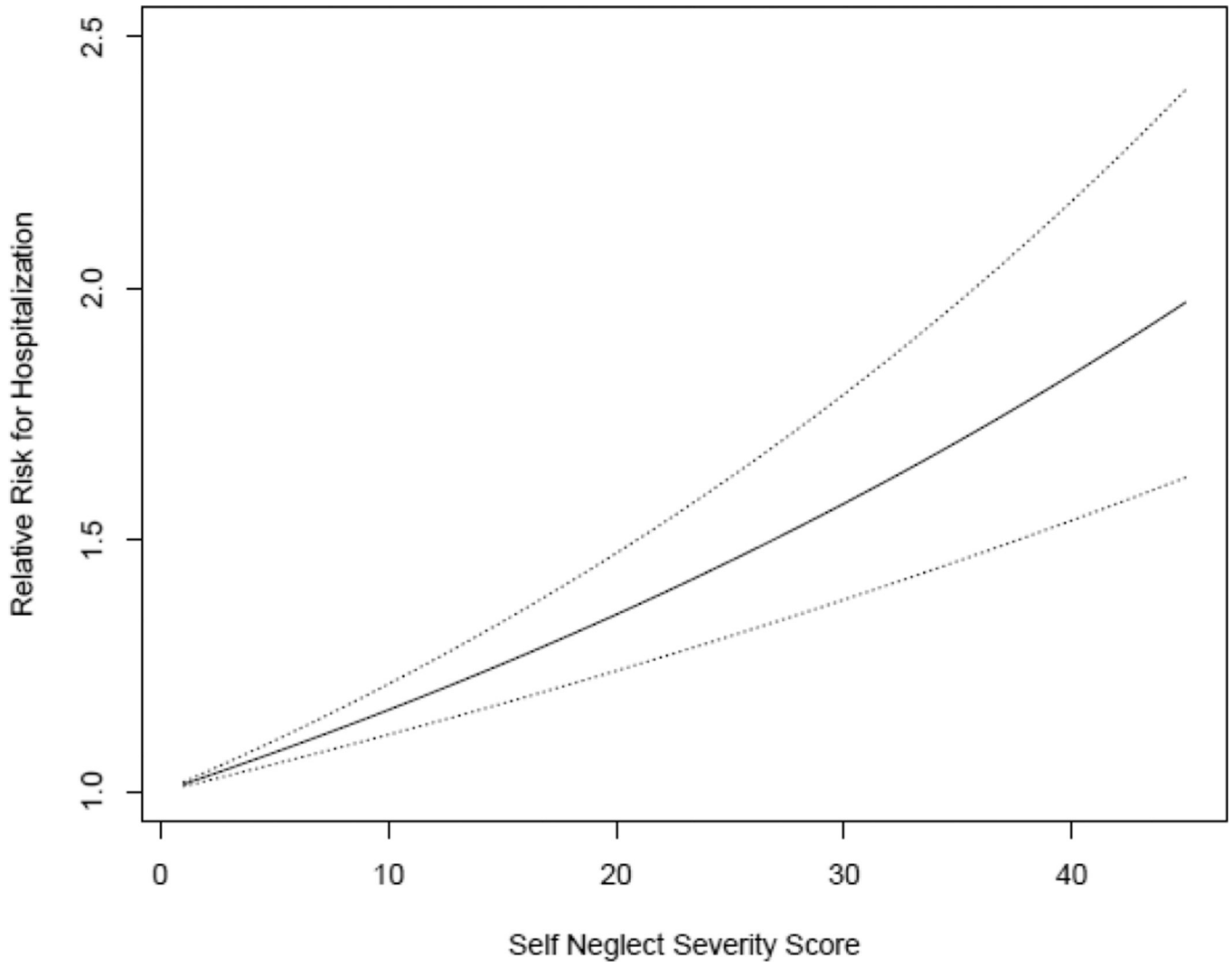

Figure 1. Elder Self-Neglect Severity and Rate of Hospitalization

suggests that there is a gradient association between greater elder self-neglect severity score and rate for hospitalization of 913 self-neglecting older adults. The solid black line indicates the relative risk of hospitalization as the self-neglect severity increase. The dotted grey line indicates the 95% confidence interval of the relative risk of hospitalization.

X-axis: represent the elder self-neglect severity score from 1 – 45

Y-axis: represent the increase in the rate of hospitalization calculated based on the number of hospitalization per year.

Table 1

Elder Self-Neglect and Rate of Hospitalization

	Mean	SD	Median	IQR	t-test	F-test	P value
No Reported Self Neglect	0.55	1.26	0.17	0.56			
Reported Self Neglect	1.79	3.24	0.50	2.02	21.76		<0.001
Confirmed Self Neglect	1.93	3.40	0.56	2.20	21.57		<0.001
Self Neglect Severity							
Mild	1.67	3.66	0.40	1.61			
Moderate	1.95	3.24	0.63	2.35			
Severe	2.72	3.98	0.77	4.29		4.60	<0.001

SD: Standard Deviation. IQR: Inter-Quartile Range

Rate of hospitalization refers to the number of hospitalizations per year

Table 2

Elder Self-Neglect and the Rate of Hospitalization of 6864 Older Adults

Reported Self Neglect (N=1165) **Relative Risk (RR), 95% Confidence Intervals for Hospitalization Outcome**				
	Model A	Model B	Model C	Model D
Age	1.03 (1.03–1.04)	1.03 (1.03–1.04)	1.02 (1.02–1.03)	1.02 (1.01–1.02)
Men	1.18 (1.14–1.23)	1.19 (1.16–1.24)	1.16 (1.12–1.19)	1.23 (1.18–1.27)
Black	0.98 (0.94–1.02)	0.96 (0.92–0.99)	0.89 (0.85–0.92)	0.84 (0.80–0.87)
Education	0.97 (0.97–0.98)	0.98 (0.97–0.98)	0.99 (0.98–0.99)	0.99 (0.99–0.99)
Income	0.94 (0.93–0.95)	0.94 (0.93–0.95)	0.95 (0.94–0.96)	0.96 (0.95–0.97)
Medical Conditions		1.34 (1.32–1.36)	1.33 (1.31–1.36)	1.27 (1.25–1.29)
Cognitive Function			0.81 (0.79–0.83)	0.89 (0.87–0.92)
Physical Function				0.93 (0.93–0.94)
Hospitalization for Reported Self-Neglect	1.86 (1.77–1.95) +	1.58 (1.51–1.66) +	1.58 (1.50–1.66) +	1.43 (1.35–1.49) +
Confirmed Self Neglect(N=913) Relative Risk (RR), 95% Confidence Intervals for Hospitalization Outcome				
	Model A	Model B	Model C	Model D
Age	1.03 (1.03–1.04)	1.03 (1.03–1.04)	1.02 (1.02–1.03)	1.02 (1.01–1.02)
Men	1.18 (1.14–1.23)	1.19 (1.16–1.24)	1.16 (1.12–1.20)	1.22 (1.18–1.2)
Black	0.99 (0.96–1.03)	0.97 (0.93–1.01)	0.89 (0.86–0.93)	0.84 (0.81–0.88)
Education	0.97 (0.97–0.98)	0.98 (0.97–0.98)	0.99 (0.98–0.99)	0.99 (0.99–0.99)
Income	0.94 (0.93–0.95)	0.94 (0.93–0.95)	0.95 (0.94–0.96)	0.96 (0.95–0.97)
Medical Conditions		1.35 (1.32–1.37)	1.34 (1.32–1.36)	1.28 (1.25–1.29)
Cognitive Function			0.81 (0.79–0.83)	0.89 (0.87–0.91)
Physical Function				0.93 (0.93–0.94)
Hospitalization for Confirmed Self-Neglect	1.93 (1.84–2.03) +	1.65 (1.56–1.74) +	1.64 (1.56–1.73) +	1.47 (1.39–1.55) +

Note:

+ p<0.001. Rate of hospitalization refers to the number of hospitalizations per year

Table 3

Elder Self-Neglect Severity (N=913) and the Rate of Hospitalization

	Models	Parameter Estimates	Standard Errors	Risk Ratio	95% CI	P value
Mild	A	0.43	0.05	1.54	1.39–1.69	<0.001
	B	0.32	0.05	1.38	1.25–1.51	<0.001
	C	0.32	0.05	1.38	1.26–1.52	<0.001
	D	0.24	0.05	1.28	1.16–1.41	<0.001
Moderate	A	0.77	0.03	2.15	2.03–2.28	<0.001
	B	0.59	0.03	1.79	1.69–1.91	<0.001
	C	0.58	0.03	1.78	1.68–1.89	<0.001
	D	0.45	0.03	1.57	1.48–1.67	<0.001
Severe	A	0.92	0.10	2.50	2.05–3.06	<0.001
	B	0.67	0.10	1.95	1.59–2.38	<0.001
	C	0.69	0.10	2.01	1.64–2.45	<0.001
	D	0.54	0.11	1.72	1.39–2.12	<0.001

Note: Self-Neglect Severity represents a 1 point increase on the scale of 1–45.

Models: A: Adjusted for age, sex, race, education and income

B: Adjusted for A + hypertension, diabetes, stroke, cancer, hip fracture, coronary artery disease

C: Adjusted for B + MMSE, East Boston Memory Test, East Boston Delayed Recall, and Symbol Digit Modality Test

D: Adjusted for C + physical function

Table 4

Interaction Term Analyses of Self-Neglect Severity (N=913) with Health Related Factors and the Rate of Hospitalization

	Parameter Estimates	Standard Errors	Risk Ratio	95% CI	P value
Medical Conditions					
Self-Neglect	0.02	0.01	1.02	1.01–1.03	<0.001
Medical Conditions	0.28	0.04	1.32	1.23–1.42	<0.001
Self-Neglect X Medical Conditions	−0.01	0.01	0.98	0.99–1.00	0.076
Cognitive Function					
Self-Neglect	0.02	0.01	1.02	1.01–1.02	<0.001
Cognitive Function	0.03	0.05	1.03	0.94–1.14	0.538
Self-Neglect X Cognitive Function	0.01	0.01	0.99	0.99–1.00	0.154
Physical Function					
Self-Neglect	0.01	0.01	1.01	1.01–1.02	<0.001
Physical Function	−0.55	0.01	0.95	0.93–0.96	<0.001
Self-Neglect X Physical Function	0.00	0.00	1.00	1.00–1.00	0.347