Differences in Fracture Incidence According to Caregiver Type in Stroke Survivors

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Background: To assess whether the type of primary caregiver is a risk factor of the incidence of fracture among older adults who have survived a stroke. *Methods:* Data from 4282 stroke survivors in the National Health Insurance Service—Senior Cohort (2002-2013) were used in this study. We categorized type of primary caregiver as none, spouse/family caregiver, and formal caregiver. The incidence of fracture within the year postdischarge was used as the outcome variable. These data were subjected to a survival analysis using the Cox proportional hazard model. *Results:* Of the 4282 stroke survivors, 308 (7.2%) experienced a fracture during the 1-year follow-up period. According to type of primary caregiver, the adjusted hazard ratio (HR) of fracture was lower among those whose caregiver was a spouse (HR = .68, 95% confidence interval [CI], .48-.96] and those with a formal caregiver (HR = .59, 95% CI, .36-.97) compared to stroke survivors with no caregiver. In particular, those with a family or formal caregiver who were being cared for in nursing facilities were less likely to be associated with fracture than those with no caregiver. *Conclusions:* The adjusted HR of fracture among stroke survivors was lower among those with primary caregivers compared to those without them. Thus, the government should monitor and allocate the appropriate attention to stroke survivors after discharge in order to ensure that they obtain the needed health care, especially for stroke survivors who are without a primary caregiver.

Key Words: Primary caregiver—fracture—stroke—stroke survivor—postdischarge

Introduction

Stroke is a major cause of death and long-term disability in most industrialized populations. Every year in Korea, approximately 105,000 experience a new or recurrent stroke and that more than 26,000 died.[1] More than half of all strokes occur in people aged 75 years or older, and there is an increasing trend in stroke incidence, especially in the elderly population, because the population is living longer.[2] Because of the rapid increase of the elderly population in Korea, stroke incidence is projected to increase by 3.5-fold by 2030.[1] As advances in modern medicine, survival rate of stroke expected to increase and the majority of stroke survivors will be discharged home with mild to moderate deficits which may affect balance and mobility.[3] Therefore, support for discharged stroke survivors is important to prevent adverse health event considering their frailty.

Previously, fractures are known as one of a major complication of stroke.[4,5] Prior studies seeking to determine the mechanisms of fracture after stroke have shown that stroke patients are more likely to experience fractures

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Received January 16, 2018; revision received June 8, 2018; accepted June 14, 2018.

Disclosures: None.

Sources of Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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1052-3057/$ - see front matter

https://doi.org/10.1016/j.jstrokecerebrovasdis.2018.06.015

because of the bone density changes, cognitive functioning impairments, motor dysfunction, and visual impairment that typically follow stroke.[6,7] In addition, accidental falls leading to fractures can also have a number of other consequences, such as injury, hospitalization, impaired mobility, functional decline, nursing home placement, and fear of recurrent falling, all of which can increase the burden on both patients and caregivers.[3] Therefore, fractures represent a major health problem for older adult stroke survivors.

Efforts to prevent falls among older adults are based on identifying groups who have an increased risk of fractures and falling.[8,9] For stroke patients, injurious falls are considered common adverse events at all stages of care, such as within the acute-care setting or postdischarge settings (e.g., rehabilitation or community-based settings).[3] In particular, the prevalence of these adverse events among community-dwelling stroke survivors appears to be somewhat higher than that among stroke survivors in other settings.[10] Previously, a number of factors among stroke survivors have been identified—for instance, transferring patients appears to heighten the risk of a fall,[10-12] while patients who are living with a spouse tend to have a higher risk of frequent fall compared to those living alone.[13] In postdischarge settings, formal/informal caregivers have a critical role in optimizing health for older patients.[14] Postdischarge care for stroke survivors is often provided through the support of formal caregivers (e.g., paid caregiver from the use of home care service in long-term care insurance) or informal caregivers (e.g., family members), but occasionally stroke survivors will have no caregivers at all.[15]

Considering the importance of assistance from caregivers in the prevention of fractures among older adult stroke survivors, research on the association between type of primary caregiver and fracture incidents would be necessary. Furthermore, none of the studies have not been examined with Korean National Health Insurance Service—Senior Cohort which include representative samples of Korean older adults.

This study was designed to investigate the association between type of primary caregiver and incidence of fractures among older adults who have survived a stroke based on representative data from the Korean elderly population. We hypothesized that stroke survivors without a primary caregiver would have a higher incidence of any type of fracture at postdischarge compared to those with a family caregiver. Also, the association between primary caregiver and fracture differs depending on type of care site.

Methods

Data

We used data from the National Health Insurance Service—Senior Cohort (2002-2013) from the National Health Insurance Corporation. This dataset is representative of Korean senior population, and comprises data from general health insurance and long-term care insurance (LTCI) claims, as well as national-level data that the Korean government requires for the assessment of LTCI eligibility; these data fall into 5 main categories, as follows: sociodemographic information, general health status, LTCI application and final decision, an LTCI checklist, and preliminary and adjusted total assessment scores (LTCI approval scores). The national LTCI assessment was initially conducted in 2008 to identify the number of potential beneficiaries and determine the severity of their conditions, which served as a baseline assessment for all beneficiaries in the dataset. Specific guidelines for the process of assessment and documentation ensured the quality of the data. The LTCI checklist is a standardized list used to evaluate the care needs of beneficiaries, and serves as the basis for allocating the national LTCI budget, which accounts for 6.5% of the total national health insurance revenue. The research was conducted according to the principles of the Declaration of Helsinki.

Study Population and Design

We used several criteria to ensure a suitably homogenous study population, which would allow us to accurately determine the association between type of primary caregiver and fracture incidence among elderly stroke survivors. First, we included only stroke survivors who were newly diagnosed with ischemic stroke. Second, we restricted the study population to only individuals with information on their primary caregiver in the 2008 LTCI eligibility assessment dataset (see above). These inclusion criteria were selected because (1) those who have the history of previous stroke tend to have a differing severity of illness compared to patients who have been newly diagnosed with stroke, which could lead to a difference in patients' choice of caregiver, and (2) patients with LTCI eligibility assessment data are more likely to have similar characteristics, such as levels of physical and psychological dysfunction. Of the 558,147 individuals from the 2008 cohort, the total number of individuals admitted to acute care hospitals via the emergency departments with a primary complaint of ischemic stroke between January 1, 2008 and December 31, 2013 was 43,186. The ischemic stroke diagnosis was made according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) (i.e., code I63 [ischemic stroke]).[16] Of these individuals, we excluded 22,347 who had been hospitalized for ischemic stroke before 2008. Furthermore, we excluded a further 16,118 survivors with no information on their primary caregiver. Finally, among the remaining 4721 patients with newly diagnosed