



## Research Article

## Predictive Factors associated with Death of Elderly in Nursing Homes



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## SUMMARY

**Purpose:** An increasing elderly population reflects a great need for readily accessible, clinically useful methods to identify mortality-related factors in nursing home residents. The purpose of this study was to identify factors associated with the deaths of nursing home residents.

**Methods:** Data was collected from a Minimal Data Set of 195 elderly nursing home residents, followed by analysis of demographic factors, disease and nursing condition factors, Activities of Daily Living (ADL), cognitive function, behavioral patterns, and dysfunctional status.

**Results:** Major factors associated with death among nursing home residents were identified as dyspnea (odds ratio [OR] = 4.88), problematic behaviors (OR = 3.95), and ADL (OR = 3.61). These variables accounted for 31.1% of the variance in death.

**Conclusion:** Dyspnea, problematic behaviors, and ADL data were identified as the key factors associated with death among nursing home residents. Future plans for the prediction of death among nursing home residents can be made by nursing staff, factoring in these identified variables, to ensure more comfortable conditions and more responsive care.

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## Introduction

The proportion of elderly people in South Korea has been increasing rapidly. About 11.0% of the overall population is currently over 65 years of age, and this is expected to increase to 14.3% by 2018 (Statistics Korea, 2011). In addition, the growing number of nursing homes reflects this change in the elderly population of South Korea. Care and nursing of the elderly has been raised as an important social issue in light of population aging, the surge in chronic degenerative diseases following an increase in mean life expectancy, and the change of family structure in South Korea. The government has implemented a nationwide long-term care insurance policy since July 1st, 2008, in order to reduce the increasing social burden of caring for the elderly, and to prepare for an aging society. The requirements for receivers of long-term care include the following: that they be over 65 years old, have significant disabilities in administering self-care, have geriatric diseases, and have difficulty in activities of daily living (ADL) over the past 6 months. Among these, elderly persons evaluated as first grade (extremely severe) and second grade (severe) under the caring grade classification board according to need for care and for mental

and physical status, can use nursing homes for the elderly, which provide medical service (National Health Insurance Corporation, 2008).

Recently, there has been a nationwide trend with nursing homes, which is that the homes that care for the elderly in severe situations are rapidly increasing in numbers. In 2012, a total of 4,243 facilities were available (National Health Insurance Corporation, 2012). The Korean National Statistics Office reported that the number of residents in geriatric nursing homes was 28,060, and the number of deaths was 2,171. Thus, the incidence of death was 7.74% (Statistics Korea, 2007). Nursing home stays for the elderly have become more common worldwide. In Norway, almost 90% of residents lodge in nursing homes until they pass away, with 40% of all deaths occurring in nursing homes (Koch, Eriksen, Elström, Aavitsland, & Harthug, 2009).

The number of elderly persons who die in geriatric nursing homes will increase in line with the rapid increase in the number of nursing homes in South Korea. As such, this study recognizes that prediction of resident risk of death in these facilities is crucial.

Evaluation methods for the survival duration of geriatric nursing home residents are complex. Generally, the most common cause of death in the geriatric population over 65 in South Korea is cancer, followed by cerebrovascular disease, cardiac disease, respiratory system disease, and diabetes (Statistics Korea, 2010). This presents a similar trend to the causes of death per 100,000 persons in Organization for Economic Cooperation and Development countries, where

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the most common cause is cardiovascular disease, followed by neoplasm, respiratory system disease, and digestive system disease (Organization for Economic Cooperation and Development, 2012). Other factors, excluding disease, in predictive evaluation regarding cause of death include age, sex (Barba et al., 2009; Koch et al., 2009; Lee, Chau, Hui, Chan, & Woo, 2009), physical and cognitive functional disorder (Lee et al., 2009; Mattison, Rudolph, Kiely, & Marcantonio, 2006; van Dijk et al., 2005), weight loss and low body mass index (Kaiser et al., 2010; Kimyagarov et al., 2009), and high blood pressure (Barba et al.; Satish, Freeman, Ray, & Goodwin, 2001). In addition, there are various predictive factors by time point. While individual chronic diseases such as diabetes, cardiac failure, chronic pulmonary disease, and renal failure are important factors for predicting the first year death rate, the fifth year death rate is more likely to be associated with cognitive and physical disorders rather than the presence of a specific disease (Lee et al.; Mattison et al.; van Dijk et al.). As factors for evaluation usually include a combination of geriatric diseases, and not a specific disease (Kiely & Flacker, 2000; Ravaglia et al., 2008), evaluation of predictive factors for geriatric nursing home resident deaths, is complex.

In a nursing setting, prediction of death is clinically useful and valuable. Predictive factors for nursing home resident deaths may help healthcare professionals inform residents and caregivers of remaining life expectancy, and consequently, provide long-term nursing plans according to expected hospitalization periods. Early intervention in a disease may reduce the incidence of death at an early stage and provide death-related information to healthcare professionals by identifying risk factors for death. The most important thing is that the prediction of death helps healthcare professionals be prepared for future needs in a clinical nursing setting (Flacker & Kiely, 2003).

Some countries evaluate prediction studies of death by type and duration of disease (Ahmed et al., 2010; Barba et al., 2009; Koch et al., 2009; Lee et al., 2009) in order to develop various healthcare plans for those who become too old and weak. We see that dyspnea is the most common symptom in the last period of life in geriatric nursing homes in other countries. The primary causes of death are cardiac arrest (26.7%) and pneumonia (33.3%) (Goodridge, Bond, Cameron, & McKean, 2005). Recently, most studies regarding predictions of death in geriatric nursing homes have used the Minimum Data Set (MDS) which includes most nursing factors (Flacker & Kiely, 2003; Lee et al.; van Dijk et al., 2005). Van Dijk et al. reported in the study that lower ADL scores, aged 85 years and over, and the male gender are associated with a higher death rate within 1 year, using MDS evaluation tools. Lee et al. reported that elderly persons with lower ADL scores, cognitive functional disorder, and end stage diseases are likely to survive in the short term, and death rate within 5 years was 54.2%.

Several studies using MDS in geriatric nursing home residents including a study regarding cognitive behavioral disorder and mental health problems (Kim, Jung, & Lee, 2009) and a study regarding the comparison of cognitive function and grade of patients in long-term nursing has been reported (Kim, Jung, Lee, Cho, & Yoo, 2010). However, studies regarding predictive factors for geriatric nursing home resident deaths have rarely been reported.

In the future, the number of elderly who die in geriatric nursing homes will increase, in line with the rapid increase in the need for such facilities. This study was conducted to provide basic evidence for future nursing planning by identifying predictive factors for nursing home resident deaths.

### Purpose

This study was designed to identify the predictive factors for nursing home resident deaths among those who entered such

facilities between July 2008 and June 2012. The detailed objectives were as follows: (a) To compare surviving and deceased groups according to demographic characteristics, disease characteristics, and nursing status; (b) to compare surviving and deceased groups according to ADL, cognitive function, problematic behaviors, and rehabilitation status; (c) to identify predictive factors associated with geriatric nursing home resident deaths.

## Methods

### Study design

This was a descriptive study using a retrospective review of secondary data from MDS in geriatric nursing homes for long-term care between July 2008 and June 2012.

### Setting and sample

Samples were randomly selected from a list of geriatric nursing homes with at least 30 residents in city D. A total of 63 facilities including at least 30 residents, that were located in city D, were assigned identification numbers. The identification numbers were randomly assigned. Subsequently, six nursing homes were selected considering their total case number after excluding those managed by specific religious foundations and those including female residents only.

The participants comprised men and women over 65 years of age, who had entered the above geriatric facilities at the beginning of the study in July 2008. Participants whose "status of residents for long-term care evaluation table" data were at least 50% lost were excluded. Termination of the study was June 2012.

Analysis of the results regarding the status of long-term care residents was performed by reviewing the evaluation table data. Some evaluation tables were completed on-site by two nurses who had over 5 years of experience and were pretrained regarding the proper methods of review and filling out of the table.

The number of cases was at 195 in six facilities. This was based on a calculated sample size of 194 when the significant variables were medium survival analysis effects (Chow, Shao, & Wang, 2008).

### Ethical consideration

Data collection methods for this study were reviewed by the Daegu Catholic University Medical Center Institutional Review Board (IRB: CR-12-081-RES-001-R) to guarantee ethical access to participant management. Official documents with the IRB review results were then sent for approval from the heads of the selected facilities in order to obtain support from those institutions for data co-collection.

All information collected was treated confidentially and anonymously. All participants were assured that the information would never be used for any other purposes. A letter was drafted, providing information about the study and explaining the rights of participants. This letter was distributed to the participants, and the rights reiterated verbally before data collection. All participants agreed to informed consent.

### Measurement

The range of Korean MDS evaluation in the table for evaluating the status of residents for long-term care (Ministry of Health and Welfare & National Health Insurance Corporation, 2007) is classified by demographics and need for long-term care. The demographics include demographic information on residents. Need for long-term care comprises physical capabilities (basic capabilities

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