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Research Article

Factors Associated with Functional Decline in Older Adults After Discharge from an Acute-Care Hospital

Hai-Won Yoo,[1] Myo-Gyeong Kim,[2,*] Doo-Nam Oh,[3] Jeong-Hae Hwang,[4] Kun-Sei Lee[1]

[1] Department of Preventive Medicine, School of Medicine, Konkuk University, Seoul, Republic of Korea
[2] Department of Nursing, Seoul Women's College of Nursing, Seoul, Republic of Korea
[3] Department of Nursing Science, Hoseo University, Asan, Republic of Korea
[4] Department of Health Administration, Hayang Cyber University, Seoul, Republic of Korea

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ABSTRACT

Purpose: This study was conducted to investigate the trend in functional changes over time and factors associated with the number of areas showing functional decline in older adults who had been discharged from acute care hospitals.
Methods: This longitudinal study involved 156 patients aged ≥ 65 years who were admitted to one tertiary hospital in Seoul and discharged home. Authors investigated patient demographic and health-care characteristics and the number of areas showing functional decline at 1 and 3 months after discharge. The data were analyzed using univariate and multivariate Poisson regression models.
Results: The number of areas showing functional decline increased between admission and 1 month after discharge and had declined slightly at 3 months after discharge. The factors associated with the number of areas showing functional decline at 3 months after discharge were age, education level, and length of hospitalization ($p < .05$); the factors associated at 1 month after discharge were medical department and caregiver relationship ($p < .05$).
Conclusion: The results indicate that older patients with no spouse or those with their elderly spouse as their caregiver are at risk of functional decline in a greater number of areas after discharge. Therefore, a comprehensive health-care policy to ensure care continuity is required for functional health maintenance for older adults after hospital discharge.

Introduction

Korea became an aged society in 2018, with individuals aged ≥ 65 years comprising 14.0% of the entire population. Korea is expected to become a super-aged society in 2025, when this proportion will be more than 20% [1]. Furthermore, the rate of readmission for patients aged ≥ 65 years is 20.7%, with the most common reasons (accounting for 41.2% of cases) being disease recurrence and deterioration of a condition [2].

A previous study [3] demonstrated that 21.5% of patients hospitalized for acute illness showed no improvement in activities of daily living (ADLs) at discharge in comparison with their abilities before hospitalization. The study also showed that 40% of older patients experience functional decline during tertiary hospital stays and that some develop various complications, such as loss of muscle tone, incontinence or urinary retention, constipation, atelectasis or pneumonia, acute delirium, and depression [3].

The likelihood of readmission is high when a patient is older, the illness is severe, complications are present, and the discharge plan is inappropriate [4]. In addition, many studies have shown that older adults have a lower quality of life (QOL), with more diseases

Hai-Won Yoo: https://orcid.org/0000-0001-5784-3576; Myo-Gyeong Kim: https://orcid.org/0000-0002-1780-1125; Doo-Nam Oh: https://orcid.org/0000-0001-5424-6020; Jeong-Hae Hwang: https://orcid.org/0000-0002-7428-5761; Kun-Sei Lee: https://orcid.org/0000-0003-1552-6761
* Correspondence to: Myo-Gyeong Kim, RN, Ph.D, Department of Nursing, Seoul Women's College of Nursing, 38 Ganhodae-ro, Seodaemun-gu, Seoul, 03617, Republic of Korea.
E-mail address: myogyeong.kim@gmail.com

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and greater functional and cognitive declines [5]. For this reason, older patients require health management before discharge, immediately after the acute-care stage, and the discharge plan should consider their functional status in advance [6].

In Canada, older patients occupy more than 55% of acute-care hospital beds, and more than 30% of older patients hospitalized for acute illness remain in a state of severe functional decline even after discharge [7]. Such situations have caused many social and economic problems, as well as deteriorating QOL [7]. The 48/6 model was developed to identify the problems resulting from the failure of older adults to recover to their normal conditions and to provide specific solutions for such patients [7]. This model is an integrated medical care system that entails screening and the evaluation of six areas of concern for hospitalized older patients and the application of patient-specific care plans within 48 hours [7]. This care transition system enables the early identification of care needs by functional area and the establishment of individualized care programs, including discharge or transfer plans with linkage to community resources needed by older patients so that they can maintain safe and normal functional status [7,8].

However, older patients and their guardians have almost no choice except to rely on convalescent hospitals and nursing homes to ensure proper care after hospital discharge [9]. Most families bear full responsibility for caring for these patients, and some avoid such responsibility and feel anxiety upon patients' discharge from the hospital [9]. A patient's place of residence is determined not by the severity of his or her disease or the need for care but by the economic capacity of the family and the availability of care at home [7,8]. Hospital discharge is the process through which patients move from hospitals back into their communities. Patients are discharged from hospitals when they are medically ready and can receive the treatments recommended by their physicians upon return to their communities [10].

Disease recurrence and return trips to hospitals for medical care can be prevented only by helping patients maintain their health status, including mental, physical, and social aspects, and by following the plans established at the time of discharge. Accordingly, the establishment of effective discharge plans is required for the continued provision of health care to older citizens. Discharge plans must include screening for conditions to which patients will be exposed in their communities, proper care, and securing of the availability of caregivers managing these plans [11]. The need for care services is rapidly increasing in Korea, and “community care” has been implemented. Patients who need care must be able to live in communities, rather than institutions, and welfare services that meet individual needs must be provided [12].

In Korea, interest in and research on the primary care needs of older patients discharged from hospitals, and how continuity of care can be sustained for these patients, have been lacking. Considering the characteristics of senile diseases, many of which are chronic and involve functional decline, the examination of functions and changes therein from hospitalization to the post-discharge period in older patients discharged from acute-care hospitals in Korea is important. A basis must be established for financial efficiency, reducing readmission through postdischarge care, and for the continuous protection of older patients, the number of individuals is increasing rapidly in the aged population of Korea.

This study was conducted to investigate the trend in functional changes over time and the factors associated with the number of areas showing functional decline in older patients who had been discharged from an acute-care hospital.

Methods

Study design

For this longitudinal study, trained surveyors collected data in inpatient units upon admission (baseline, T0), at discharge (T1), 1 month after discharge (T2), and 3 months after discharge (T3).

Sample and data collection

The survey was conducted from September 1, 2016, to October 31, 2017, through face-to-face interviews at one tertiary hospital in Seoul while the patients were hospitalized and at the patients' homes after discharge. Two surveyors with more than 5 years of experience in older patient care collected data through verbal and nonverbal responses from patients. When patients' answers were ambiguous or inaccurate, surveyors assessed their health functions by talking to them or examining their environment or mobility to minimize measurement errors. This study used only two qualified surveyors and provided more than 3 hours of preliminary education and survey guidelines to minimize differences between the surveyors.

Authors recruited a convenience sample from the hospital. Patients who aged $\geq$ 65 years and were admitted to the tertiary hospital were included. Patients who did not have the cognitive ability to understand and respond to the survey with the help of the medical staff on the wards were excluded.

189 patients were recruited who agreed to participate in the study. The response rates were 99.5% (T0 and T1), 92.1% (T2), and 82.5% (T3). Authors lost 33 subjects: 11 subjects refused to participate, 2 had been readmitted at 1 month after discharge, 2 had died at 3 months after discharge, and 18 cases had inadequate data. The final number of participants was 156, which satisfied the minimum sample size required for regression analysis which was 114, with a medium Cohen [13] effect size of $f^2 = 0.15$, two-sided 5% significance level, and 80% power.

Measures

Dependent variables

The dependent variables were the numbers of areas showing functional decline at 1 and 3 months after discharge in older patients. Functional decline is the decreased ability to meet one's own daily needs [14]; for this study, we defined it as a state of decreased function from previously or lack of improvement from a reduced state. For example, we asked older patients the following question about cognitive function: “Have you noticed a marked decline in your judgment, thinking, or memory within the last year (or compared to last time)?” A “yes” response was considered to indicate a decline in cognitive function. Surveyors considered caregivers' opinions when patients' answers were questionable according to the survey guideline. Therefore, the number of areas showing functional decline was defined by the following formula:

Table 1 *Functional Areas in 48/6 Model.*

Functional areas	Cognitive function	Cognitive impairment
		Depression
	Medication	Polypharmacy
	Functional mobility	Mobility problems
	Pain	Pain
	Bowel and bladder management	Urinary incontinence
		Fecal incontinence
	Nutrition and hydration	Dysphagia
		Weight loss

Number of areas showing functional decline

= *sum* (Σ) *of areas of functional decline* (*yes*)

This study used the initial crude assessment of the Korean version of the 48/6 model [9], which assesses nine types of functional decline in six functional areas (Table 1).

As patients experience decline in several functional areas, they require more medical services for treatment, their care needs increase, and their QOL decreases [5]. Functional decline can be defined as new loss of independence in self-care activities, measured on an ADL scale such as the Instrumental ADL Scale [15], but these measures do not include cognitive functional decline. Thus, this study used the 48/6 initial screening areas in this study to evaluate physical and cognitive functional declines in older adults. In response to previous findings that an increasing number of areas of functional decline affect daily life and QOL in older adults [5], the numbers of areas showing functional decline were selected as dependent variables to fulfill the purpose of this study. The range of the number of areas showing functional decline was 0 to 9, with larger numbers reflecting reduced function in more areas.

Independent variables

Independent variables included demographic characteristics, such as age, gender, education level, household income, and household type, as well as health-care factors, such as medical department, length of hospitalization, difficulty purchasing medications, and caregiver relationship. These data were collected at admission and discharge. Age and length of hospitalization were continuous variables, household income was categorized into three levels, and education level was categorized into four levels equally according to the distribution of the variables. The medical department was categorized as internal medicine, surgical, and others based on the main diagnosis at admission. Difficulty purchasing medication meant financial difficulty when buying medications in this study and was categorized as “yes” or “no.”

Statistical analysis

The data were analyzed using SPSS, version 24.0, statistical software (IBM Corp., Armonk, NY, USA). A descriptive analysis was used to characterize the participants. Associations of the numbers of areas showing functional decline at 1 and 3 months after discharge with the subjects’ characteristics were analyzed using univariate Poisson regression analysis, and the factors affecting the numbers of areas showing functional decline were analyzed using multivariate Poisson regression analysis after adjusting for other variables, including demographic and health-care characteristics. This study used Poisson regression because the dependent variable was not distributed normally, the data count was < 9, and the data had an L-shaped Poisson distribution. Authors accepted an alpha level of .05 as significant.

Ethical considerations

This study obtained ethical approval from the Institutional Review Board of the Konkuk University (Approval no. 7001355-201610-HR-142). Patients gave their written informed consent to participate in the study. The study participants were informed that they could refuse participation in the study whenever they wanted. Guardians replied for patients for whom response was too difficult because of cognitive functioning problems that developed during the study period.

Results

General characteristics of the participants

Table 2 shows the demographic and health-care profiles of the study participants. The average age of the participants was 73.14 years, and 49.4% had household incomes of <1 million won. Most (62.8%) participants lived in households with their spouses, 21.2% lived with children or other relatives, and 16.0% lived alone. Half (50.0%) of participants had graduated from middle or high school, and 39.1% had education levels of elementary school graduation or less. About half (50.6%) of patients were hospitalized in the department of internal medicine, and 35.3% of patients underwent surgery. The average length of hospitalization was 7.54 days, and 24.4% of the subjects had difficulties purchasing drugs. The spouses of 65.4% of patients served as caregivers, and children or other relatives served as caregivers for 30.1% of patients.

Functional decline over time by area

Examination of the nine types of functional decline from the time of admission to 3 months after discharge showed that overall patient health functions decreased as the number of functional declines increased at 1 month after discharge, with slight recovery observed at 3 months after discharge. However, even at 3 months after discharge, declines were present in all functional areas, and the number of areas showing functional decline was larger than that at the time of admission (Figures 1 and 2).

Among the functional areas, polypharmacy was the most common functional decline at any time except at discharge (T1), and functional declines increased 1 month after discharge (T2) and decreased 3 months after discharge (T3) in most functional areas, except cognitive impairment. Notably, the proportion of older adults with weight loss increased to 30.8% at T2, from 6.4% at the time of admission (T0). On the other hand, cognitive impairment increased steeply at, as compared with T0, and decreased at T2 but slightly increased again at T3 (Figure 2).

Table 2 *Characteristics of the Participants (N = 156).*

Variables	Categories	*n* (%) or M (SD)
Gender	Men	81 (51.9)
	Women	75 (48.1)
Age (yrs)		73.14 (5.04)
Family income (million won/ month)	≤100	77 (49.4)
	≤200	38 (24.4)
	>200	41 (26.3)
Family structure	Solitary	25 (16.0)
	Man and wife	98 (62.8)
	Living with children or others	33 (21.2)
Education level	Less than elementary school	61 (39.1)
	Middle and high school	78 (50.0)
	More than college	17 (10.9)
Medical department	Surgical	55 (35.3)
	Internal medicine	79 (50.6)
	Others	22 (14.1)
Length of stay (days)		7.54 (5.32)
Difficulty purchasing medications	Yes	38 (24.4)
	No	118 (75.6)
Caregiver	None	7 (4.5)
	Spouse	102 (65.4)
	Children or others	47 (30.1)

Note. M = mean; SD = standard deviation; yrs = years.

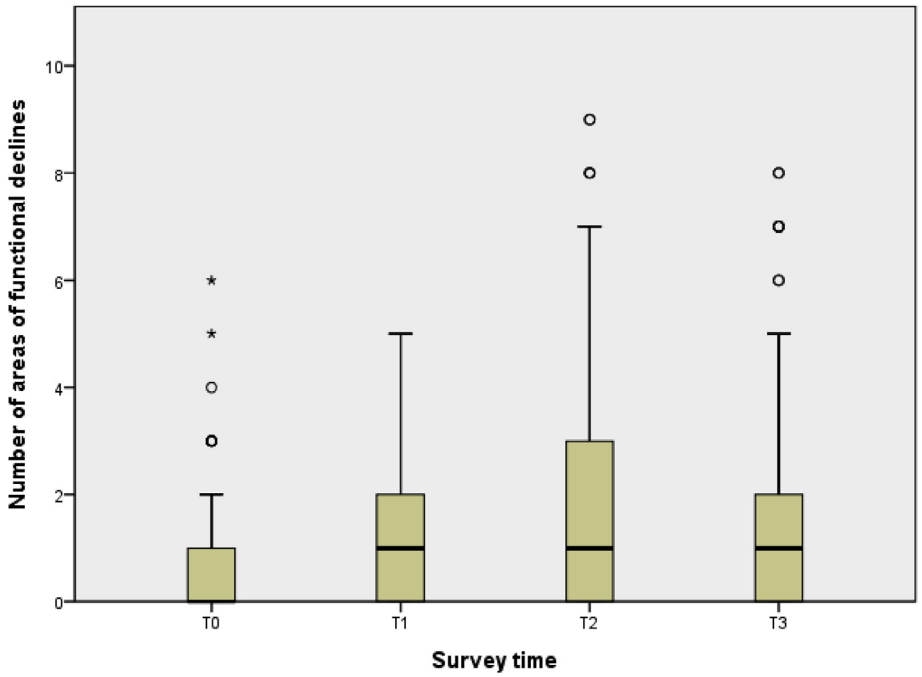

Figure 1. Distribution of the number of areas showing functional decline by survey time.
Note. T0: at admission, T1: at discharge, T2: 1 month after discharge, T3: 3 months after discharge.

Factors associated with the number of areas showing functional decline

The factors associated in the univariate analysis with the number of areas showing functional decline in older adults at 1 month after discharge were age, medical department, and caregiver relationship; in the multivariate regression analysis with adjustment for other variables, only the medical department and caregiver relationship were significant. More areas showed functional decline in patients who received internal medicine treatment than in patients admitted to the surgical department who did not undergo surgery [B = 0.56, 95% confidence interval (CI) = 0.15–0.97]. In addition, patients who did not have caregivers (B = 0.65, 95% CI = 0.07–1.22) and those who had their spouses as caregivers (B = 0.38, 95% CI = 0.08–0.68) had significantly more areas showing functional decline than did patients who had their children as caregivers (Table 3).

The factors associated in the univariate analysis with the number of areas showing functional decline in older adults at 3 months after discharge were age, medical department, and length of hospitalization; in the regression analysis with adjustment for other variables, age, education level, and length of hospitalization were significant. The number of areas showing functional decline increased with age (B = 0.04, 95% CI = 0.01–0.07) and was greater in patients with less than elementary school education than in those with high school/university graduation and higher education levels (B = 0.60, 95% CI = 0.05–1.15). On the other hand, the number of areas showing functional decline decreased with longer hospitalization (B = −0.04, 95% CI = −0.07–0.00). Although more areas showed functional decline in patients who received internal medicine treatment than in patients admitted to other departments, this difference was not significant (p = .051; Table 3).

Discussion

This study provides fundamental data for the development of a comprehensive health-care management service, based on examination of the trend in functional changes in older adults over time. Authors investigated factors associated with the number of areas showing functional decline in older adults who were discharged from a hospital.

The number of areas showing functional decline in older adults discharged from an acute-care hospital decreased slightly at T2 and T3 after discharge in most areas.

The proportion of older adults with unintentional weight loss increased from 6.4% at T0 to 30.8% at T2 and then decreased to below 20% at T3. Weight loss in older adults can occur for various reasons, such as dysphagia, dental insufficiency, and poor food intake, resulting in malnutrition [16]. Dysphagia, a common condition in patients suffering from stroke, Parkinson's disease, and Alzheimer's disease [17], increased from 3.2% at admission to 8.3% at 1 month after discharge and slightly decreased to 5.8% at 3 months after discharge. In addition, the problem of nutritional management and resulting weight loss in older adults with functional limitations is reported to be more than twice that of older adults without functional limitations [18], and malnutrition is reported to be associated with impaired activity in older adults [19]. Therefore, authors think that the high weight-loss prevalence at 1 month after discharge was because functional conditions such as dysphagia and mobility problems had not yet recovered, resulting in difficulty in regularly preparing or consuming nutritious food, thereby causing weight loss. Although the rate of weight loss at 3 months after discharge was still higher than that at the time of admission, authors could not find any studies on recovery times for weight loss in older adults; in this study, more than 3 months was required, so further research is needed. The high prevalence of weight loss in older adults after hospital discharge may result in increased morbidity, loss of independence, and mortality, as well as increased use of health-care services and social expenditures [16]. As the maintenance of balance in nutrition and hydration is mandatory for a long, healthy life in older adults [16], a rigorous management system in the community is required for older adults who experience unintentional weight loss after discharge.

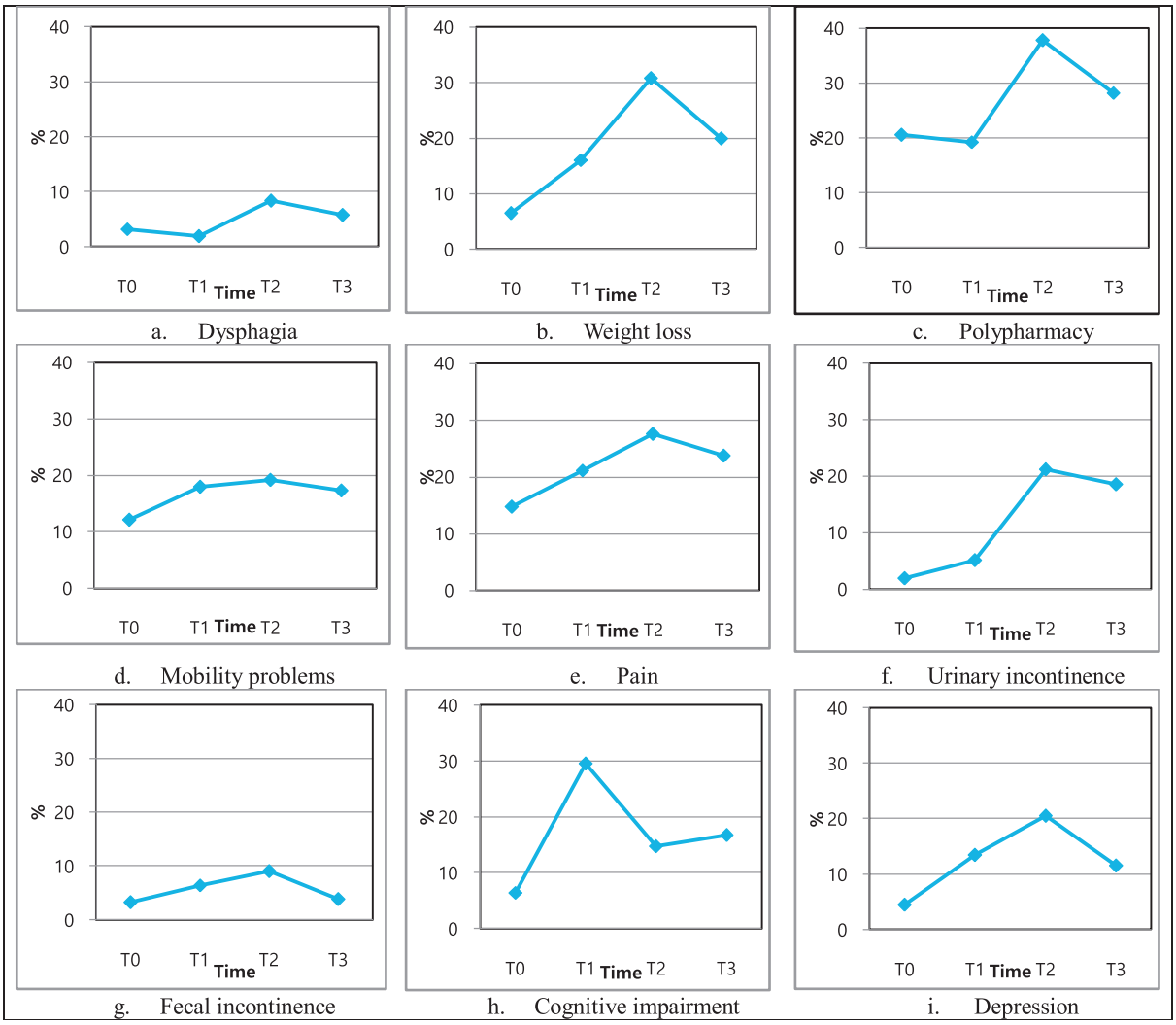

Figure 2. The trend in functional decline over time by functional areas.
Note. Axis X: time, Axis Y: the percentage of people showing functional decline, T0: at admission, T1: at discharge, T2: 1 month after discharge, T3: 3 months after discharge.

The proportion of patients with polypharmacy (use of five or more drugs) increased from 19.2% at T1 to 37.8% at T2 and then decreased slightly to 28.2% at T3. Older adults often take several drugs because they have various chronic diseases [20]. However, some of these drugs are potentially inappropriate, and their concurrent use may cause harmful drug interactions or adverse drug reactions [21]: for example, prescriptions for five or more drugs, and physicians who prescribe five or more drugs to individual patients, have been reported to be correlated strongly with potentially inappropriate drug administration [21]. Polypharmacy may inhibit functional mobility due to drug interactions or side effects, increasing the rate of falls and the level of cognitive impairment in older patients [8]. Therefore, the drugs administered to older patients must be monitored carefully in the community.

The proportion of patients with depression increased to 20.5% at T2 and then decreased to 11.5% at T3. On the other hand, the proportion of patients with cognitive impairment was relatively high at 30%, at T1, as compared with T0, and then decreased slightly at T2. Cognitive impairment and depression in older adults are associated with various factors, such as pain, incontinence, dysphagia, polypharmacy, and weight loss due to malnutrition [8]. The steep decrease in cognitive ability at T1 occurred because cognitive ability appears to decline when older adults are hospitalized in an unfamiliar environment [22]. It slowly recovers upon returning to a familiar environment after discharge [22]. However, older patients seem to become depressed after discharge because of pessimistic emotions related to functional disability and being unable to receive the care provided at the hospital but then tend to recover naturally by 3 months after discharge. Therefore, delirium and depression must be detected in advance, during hospitalization and at the time of discharge, relevant risk factors must be resolved, and continuous monitoring must be maintained thereafter.

The number of areas showing functional decline was affected by the medical department and the caregiver relationship at T2 in this study. Older patients who received internal medicine treatment and those with no caregiver or spouses as caregivers had more areas of functional decline. The former result appears to be reasonable, considering the complex characteristics of chronic diseases in older adults. Surgical care does not appear to cause a dramatic decline in patient function as long as postoperative care is

Table 3 *The Results of Univariate and Multivariate Analysis on the Number of Areas Showing Functional Decline at 1 Month or 3 Months after Discharge (N = 156).*

Characteristics	Categories	T2 (1 month after discharge)				T3 (3 months after discharge)			
		Unadjusted		Adjusted†		Unadjusted		Adjusted†	
		B	(95% CI)	B	(95% CI)	B	(95% CI)	B	(95% CI)
Gender	Man	−0.11	(-0.34, 0.12)	−0.09	(-0.35, 0.17)	−0.09	(-0.35, 0.18)	−0.08	(-0.38, 0.22)
	Woman	Ref.		Ref.		Ref.		Ref.	
Age (yrs)		0.04	(0.01, 0.06)*	0.02	(0.00, 0.04)	0.04	(0.01, 0.06)*	0.04	(0.01, 0.07)*
Family income (million won/month)	≤100	0.17	(-0.10, 0.45)	0.14	(-0.18, 0.46)	0.06	(-0.26, 0.39)	−0.17	(-0.55, 0.20)
	≤200	−0.11	(-0.45, 0.24)	0.00	(-0.36, 0.36)	0.23	(-0.13, 0.59)	0.23	(-0.15, 0.62)
	>200	Ref.		Ref.		Ref.		Ref.	
Family structure	Solitary	−0.04	(-0.43, 0.34)	−0.04	(-0.45, 0.37)	−0.25	(-0.71, 0.21)	−0.13	(-0.61, 0.35)
	Man and wife	0.01	(-0.28, 0.30)	0.20	(-0.11, 0.51)	0.01	(-0.31, 0.33)	0.12	(-0.23, 0.47)
	Living with children or others	Ref.		Ref.		Ref.		Ref.	
Education level	Less than elementary school	0.08	(-0.33, −0.47)	−0.01	(-0.47, 0.44)	0.31	(-0.18, 0.80)	0.60	(0.05, 1.15)*
	Middle and high school	0.13	(-0.27,-0.38)	0.04	(-0.38, 0.46)	0.26	(-0.23, 0.75)	0.44	(-0.08, 0.95)
	More than college	Ref.		Ref.		Ref.		Ref.	
Medical department	Surgical	0.01	(-0.41, 0.44)	0.04	(-0.40, 0.49)	0.21	(-0.26, 0.68)	0.20	(-0.31, 0.71)
	Internal medicine	0.55	(0.17, 0.94)*	0.56	(0.15, 0.97)*	0.46	(0.02, 0.90)*	0.47	(0.00, 0.95)
	Others	Ref.		Ref.		Ref.		Ref.	
Length of stay (days)		0.00	(-0.02, 0.03)	0.01	(-0.01, 0.04)	−0.03	(-0.06, 0.00)*	−0.04	(-0.07, 0.00)*
Difficulty purchasing medications	Yes	−0.06	(-0.33, 0.21)	−0.02	(-0.31, 0.27)	−0.02	(-0.33, 0.29)	0.21	(-0.12, 0.53)
	No	Ref.		Ref.		Ref.		Ref.	
Caregiver	None	0.64	(0.13, 1.15)*	0.65	(0.07, 1.22)*	−0.19	(-0.98, 0.59)	−0.51	(-1.35, 0.34)
	Spouse	0.35	(0.08, 0.63)*	0.38	(0.08, 0.68)*	0.26	(-0.04, 0.57)	0.27	(-0.06, 0.59)
	Children or others	Ref.		Ref.		Ref.		Ref.	

Note. CI = confidence interval; yrs = years. * $p < .05$.
† Adjusted for gender, age, family income, education level, medical department, length of stay, difficulty in purchasing medicines, and caregiver.

adequate because most patients undergo surgery when their preoperative baseline health status is stable [23]. Therefore, not only surgical care but also medical management of chronic diseases should be considered to be important in older patients. The latter result indicates that not only the absence of a caregiver but also dependence on care from one's spouse, who is also an older patient, may be problematic for the functional recovery of an older patient. These results reveal the great need for social services providing care, other than the medical care required for senile diseases that result in functional decline and chronic diseases [2]. However, no difference was observed in the number of areas showing functional decline according to gender, age, or household income, which differs somewhat from previous findings. Authors most likely obtained this result because the timepoint of 1 month after discharge is insufficient to show differences depending on gender, age, and household income.

In addition, the number of areas showing functional decline was affected by age, education level, and the length of hospitalization at T3 in this study. Patients who were older, those who had shorter hospital stays, and those with less than elementary school (vs. more than college) education tended to have more functionally impaired areas. These results are similar to those of a previous study [18], in which younger patients with higher education levels had better physical functional status. Researchers believe that shorter hospitalizations reduce the chance of functional recovery. Further in-depth research on the association between the length of hospitalization and functional recovery after discharge in older patients is required.

The prevention of functional aggravation after discharge and the improvement of the functional status of older patients not only promote well-being of the patients and their family members but also reduce the burden on society [18]. For this reason, older patients must implement health behaviors before discharge, immediately after acute care, and postdischarge plans must consider patients' functional status before hospital admission [24]. Maurer and Ballmer [25] reported that 9–48% of hospital readmissions are preventable and associated with inappropriate medical care, such as inadequate resolution of a problem that occurred during prior hospitalization, inadequate treatment at the time of discharge, and inappropriate management of health after discharge. These problems can be prevented with patient and caregiver education, evaluation before discharge, and the establishment of post-discharge management plans. Therefore, evaluation and the establishment of a postdischarge management plan that considers the patient's physical condition and psychiatric/social aspects must be emphasized from the time of admission [26]. Authors suggest that the medical services required by patients be provided continuously, through the standardization of evaluation items and postdischarge planning, and the integration of disorganized healthcare information via linkage between the hospital and community for more efficient postdischarge management.

Hospital charges for older patients have been increasing rapidly [27]. Such issues are difficult to resolve within the current medical system, which is focused on hospitals, and the implementation of community-based systems linking patients discharged from the hospital will be challenging [28]. Some countries, including the USA, Canada, and Japan, have long emphasized policies promoting the support of patients in their homes [29].

Various attempts have been made to expand services enabling participation in community activities and to promote community-based aid of those who are vulnerable; such trends are generally called “community care” [30]. However, the concept of community care is not easy to realize in Korea because of the inferior infrastructure and environment, which prevent proper management of cooperative systems between hospitals and communities [30].

The implementation of community care requires the participation of community residents and organizations [7]. Authors argue that the securing of specialists who can support such implementation is critical. In particular, the securing of a sufficient number of nurses for regular care of patients at home and in community systems providing medical treatment and care separately from hospitals and other facilities is urgently required. Accordingly, the development of care service programs and securing of care continuity focused on older patients is needed. Active care services can be provided by assessing the health status and care needs of older patients when they are hospitalized to

determine which interventions and linked services are appropriate for patients at each step after hospital discharge [7].

This investigation of factors affecting the number of areas showing functional decline in older patients sheds light on the areas of service that older patients need and provides specific information for the development of a health-care service system for elderly individuals. The functional areas of polypharmacy, pain, weight loss, and incontinence should be considered as service-intensive areas. A system connecting hospitals to communities is required for the protection of older adults' health and QOL through maintenance of their functioning status, and financial support for such a system should be provided through public social services.

Limitations

This longitudinal study was conducted at one hospital with a small sample. Based on the inclusion and exclusion criteria, only 156 hospitalized older patients participated in the study. The dropout rate was high because the study period was almost 1 year, extending from admission to 3 months after discharge. In addition, self-reporting with a one-item measure of cognition could be a limitation. Moreover, authors asked crude questions to determine whether or not each function was reduced. In addition, this study did not include patients' illness or severity thereof in the analyses, and did not control for other confounding variables related to patients' home environments that might have affected the results. This study examined only the number of functionally declining areas in this study, but the factors affecting each area may be different; thus, further study of the factors affecting each functional area is needed.

Conclusion

This study revealed that demands for service were high in functional areas such as polypharmacy, pain, weight loss, urinary incontinence, and mobility after discharge. The finding that most patients had no caregiver or spouses as caregivers and that this situation affects functional decline in older patients indicates that public social support is required to ensure the continuity of care services. Therefore, further research is needed to provide concrete data for the establishment of a comprehensive health management service policy and to analyze in depth the factors that affect the health functions of older patients.

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Conflict of interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2019.05.001.

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