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Differences in the Health Status of Older Adults in Community and Hospital Cohorts

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Background: Older adults frequently utilize healthcare services across diverse medical settings to maintain continuity of care. However, data from the hospital records of older adults is often not linked to their health status in community settings, preventing a full understanding of their healthcare needs. **Methods:** This study aimed to compare the multidimensional health status (i.e., self-rated health, depression, physical function/activity, mobility, nutrition, lifestyle factors, blood laboratory, and diseases) of older adults between community and hospital cohorts. The goal was to identify the potential health problems of older adults and establish a preventive care system. Secondary analysis was conducted using data obtained from the Korean Urban Rural Elderly study for the community cohort and outpatient patients from a single tertiary hospital for the hospital cohort. **Results:** Using age- and sex-matched propensity score matching, 550 older adults were selected equally from the two cohorts. Logistic regression was performed to predict the health status of the two groups. The health status of the community and hospital cohorts differed in several health domains. The hospital cohort group had more risk of depression, impairment in instrumental activities of daily living, and malnutrition. The hospital cohort group had lower alcohol intake and albumin, and higher glucose levels. The hospital group also had a higher prevalence of stroke and depression. **Conclusion:** The findings of this study highlight the need to provide multidimensional healthcare services that consider the deterioration of multiple health conditions in older adults.

Key Words: Geriatric assessment, Health status, Aged

INTRODUCTION

Older adults utilize health care services the most because they are not only likely to have disease-related problems, but also multidimensional health problems that may be caused by physiological, psychosocial, and environmental factors. Identifying the potential risks and current health problems of older adults from a multidimensional perspective can facilitate the timely development of a care plan. Substantial evidence has shown that tailored, timely care plans can reduce medical service utilization, prevent further health deterioration, and secure safety and independence among older adults.[1,2]

Given that older adults who make hospital visits are prone to chronic diseases, it is imperative to identify the health issues of community-dwelling older adults as early as possible. The Comprehensive Geriatric Assessment (CGA) is a well-known tool for assessing the health status of older adults with complex healthcare needs and providing tailored interventions.[3-5] The tool includes validated measurement procedures that cover multiple health domains, including medical (e.g., comorbidities, present illnesses, medications, and nutrition) and functional (e.g., activities of daily living, fall/mobility such as gait and balance, physical activity levels, and mood states) assessments. If implemented on an ongoing basis, CGA enables continuous monitoring of older adults' health

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status across different healthcare settings (i.e., from the community, long-term care, and acute clinical settings). Comparing the health status of older adults utilizing healthcare in different settings may help providers offer timely, tailored care.

Exploring the health status of older adults has become the focus of research initiatives, and ongoing projects have been collecting and following up on relevant data. However, few studies have compared CGA results between cohorts or compared CGA continuously between settings. While some studies have utilized CGA in population-based cohort research,[6-10] studies combining cohort data between regions or settings remain limited. Research conducted to establish baseline data on older adults is mainly investigated at the community or hospital level, with data often fragmented at each level. This fragmentation limits the ability to evaluate the continuity of care. Furthermore, the number of hospitals performing CGA in Korea is very limited due to reasons such as human resources and cost. In addition, even if CGA is performed in each setting, the results of health status cannot be compared on the same line because various CGA tools are used. By comparing two cohorts collected from the same setting, using the same providers, and applying the same CGA tool, the differences between the two different cohorts can be analyzed relatively accurately. Therefore, this study aimed to establish baseline data on older adults by comparing data from two cohorts. By showing the difference between the two groups, we can determine what health services are needed for each group.

MATERIALS AND METHODS

Study Design and Sample

Secondary data analysis was conducted using data from the Korean Urban Rural Elderly (KURE) cohort and an outpatient cohort from a single tertiary hospital. The KURE cohort is an ongoing prospective longitudinal cohort study that began in 2012. The study is conducted by the Ministry of Health and Welfare in Korea and a university-affiliated tertiary hospital in Seoul to investigate the epidemiological characteristics of community-dwelling older adults. Study participants were drawn from both rural and urban communities to reflect the population composition of older adults in Korea. Most recently, the KURE database for 2018 and 2019 contained 1,076 participants.

CGA data was available for both cohorts. For the community cohort, CGA data were drawn from the KURE database and included data on medical/biological risk factors, physical and psychological factors, and socioenvironmental factors for study participants.[10] For the hospital cohort, data were extracted from the hospital's electronic medical records, which contained CGA data for older adults who received care in the hospital's geriatric outpatient clinic and underwent a CGA. Both groups underwent a CGA at the same institution and had the same CGA evaluation.

Data for the two cohorts were compared for variables or measurements used in common. This study was approved by the Severance Hospital Institutional Review Board (IRB No. 4-2020-0501), and informed consent from the participants was exempted as this was a secondary data analysis study.

Variables and Measures

Grouping and conditioning variable

To compare the health status of the community and hospital cohorts, a propensity score was developed using age and sex. Age was a continuous variable and sex was a dichotomous variable.

Outcome variables

The outcome variables common to the two groups were as follows: demographic data, lifestyle factors (e.g., smoking, alcohol consumption), self-rated health, depression, physical function and mobility, nutrition, and medical information including blood laboratory and diseases. Self-rated health was measured using one question from the SF-36 general health survey and rated from 1 to 5 (1 = very healthy; 5 = very unhealthy); the score was categorized into three classes: healthy (1–2), average (3), and unhealthy (4–5).[11] Depression was evaluated by the Korean version of the Geriatric Depression Scale Short Form; the score ranged from 0 to 15 and the cut-off for a high risk of depression was 8.[12]

Physical function and mobility were evaluated using various methods including grip strength, fall history, Korean Activities of Daily Living (K-ADL), Korean Instrumental Activities of Daily Living (K-IADL), International Physical Activity Questionnaire (IPAQ), and timed-up-and-go (TUG) test. For grip strength, participants were asked to alternately grasp a grip dynamometer as hard as possible with both hands. Grip strength was measured four times and the maximum value was used for the analysis. To assess falls, fall frequency in the past year, reason, and place of fall were asked. The K-ADL is a seven-item questionnaire and the K-IADL is a 10-item questionnaire; higher scores denote more dependency on both tools.[13] The cut-off in the present study was one impairment in any of the items in ADL/IADL. Physical activity was measured using the IPAQ, by which weekly metabolic equivalent (MET) can be calculated and categorized into three classes: < 600, 600–3,000, and > 3,000. Higher MET indicated more physical activity.[14] The TUG test was performed by asking the participants to stand up from the chair, walk three meters, return to the chair, and sit. The longer the task took, the lower the mobility.

Several additional variables were also collected using the CGA.

Nutrition was assessed using the Mini Nutritional Assessment, which consists of six items. Total scores ranged from 0 to 14 (0–7 = malnourished; 8–11 = risk of malnutrition; 12–14 = normal).[15] Blood laboratory included the complete blood count (e.g., hemoglobin, hematocrit, white blood cell, and platelet), serum chemistry (e.g., albumin, calcium, blood urea nitrogen, creatinine, and glucose), and other biomarkers, such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). Diseases, including hypertension, diabetes, stroke, asthma, rheumatoid arthritis, depression, and cancer, were investigated in both groups and included in the analysis.

Data Analysis

To compare the difference in the health status of the KURE and hospital cohort groups, propensity score matching (PSM) was used accounting for age and sex. First, the greedy matching algorithm was used to find the nearest and suitable age- and sex-matched counterparts and enable matching of the older adults in the two groups. Because the number of participants in the hospital cohort was 275 and the matching ratio was 1:1, the total number of participants in the present study was 550.

The health status of the two groups was compared using the chi-square, Fisher exact test, or independent t-test. Thereafter, statistical differences for each variable between the two groups were obtained using regression to consider the PSM weight for the difference. Using variables that had statistical significance in a univariate analysis, logistic regression was conducted to determine the health status of the participants in the hospital cohort compared to those in the KURE cohort (0 = KURE cohort, 1 = hospital cohort); the analysis also included the propensity matching weight. The analyses were conducted using STATA 16.0 software (Stata Corp., College Station, TX, USA).

RESULTS

Propensity Score Matching

In the initial sample, 275 of the 1,076 participants in the KURE cohort were successfully matched to 275 participants in the hospital cohort. Table 1 shows the distribution of characteristics for the 550 participants based on the estimated propensity score. Compared with the KURE cohort group, the hospital cohort group was older and more often male. The two groups were well balanced with no significant age or sex differences after matching using Kernel Density Estimation.

Differences in Health Status between the Community and Hospital Cohort Groups

After matching, significant differences were observed in most variables. The hospital cohort group had worse health status for self-rated health, higher risk of depression, more dependency on IADL, less endurance in hand grip, TUG test, and physical activity; they were also more malnourished, consumed less alcohol, and less educated. In addition, they presented worse results for hemoglobin, platelet, red blood cell count, albumin, calcium, CRP, and ESR. In terms of disease, diabetes, stroke, asthma, depression, and cancer were more prevalent in the hospital cohort group (Table 2).

The following variables showed statistical significance in the logistic regression analysis: high risk of depression (odds ratio = 2.41), impairment in IADL (2.15), risk of malnutrition (2.49) or malnourishment (6.12), education (4.12), alcohol intake (0.15), albumin (0.04), ESR (1.05), glucose (1.05), diabetes (0.33), stroke (4.33), and depression (3.15) (Table 3).

DISCUSSION

The present study revealed a unique profile regarding the differences in multiple domains of older adults' health status across community and hospital cohorts. After adjusting for the covariates, the hospital cohort participants showed more impairment in nutritional, psychological, and physical domains compared with the community cohort. In addition, lifestyle factors such as alcohol consumption and blood sugar control differed between the two groups.

Nutrition is important to prevent or manage sarcopenia and

Table 1. Comparison of participants' demographic characteristics before and after matching

Variable	Before matching			After matching		
	Urban and rural elderly cohort (n = 1,076)	Hospital cohort (n = 275)	p-value	Urban and rural elderly cohort (n = 275)	Hospital cohort (n = 275)	p-value
Age (y)	75.11 ± 4.24	79.43 ± 6.53	< 0.001	78.50 ± 5.00	79.43 ± 6.53	0.060
Sex						
Male	360 (33.46)	108 (39.27)	0.07	115 (41.82)	108 (39.27)	0.543
Female	716 (66.54)	167 (60.73)		160 (58.18)	167 (60.73)	

Values are presented as mean±standard deviation or number (%).

Table 2. Differences in demographics, health behaviors, and health status between the two cohort groups (n=550)

Components and variables	Urban and rural elderly cohort	Hospital cohort	t or z	p-value
Self-rated health				
Healthy	119 (43.43)	65 (25.59)	4.44	< 0.001
Average	78 (28.47)	70 (27.56)		
Unhealthy	77 (28.10)	119 (46.85)		
Depression				
Low risk of depression	188 (68.36)	116 (43.12)	5.91	< 0.001
High risk of depression	87 (31.64)	153 (56.88)		
Activities of daily living				
0 item	274 (100)	208 (78.79)	-	-
1 or more impairment	0 (0)	56 (21.21)		
Instrumental activities of daily living				
0 item	228 (83.21)	107 (40.68)	5.16	< 0.001
1 or more impairment	46 (16.79)	156 (59.32)		
Grip strength (kg)	24.43 (7.77)	20.33 (9.34)	-3.41	0.001
Male (n = 221)	30.95 (6.56)	26.70 (9.57)	-1.99	0.048
Female (n = 318)	19.74 (4.52)	16.06 (6.27)	-1.53	0.127
Timed up and go test (n = 492)	12.18 (3.90)	12.49 (7.23)	-2.96	0.003
Physical activity (MET)				
< 600	81 (29.45)	155 (56.36)	-3.01	0.003
600–3,000	155 (56.36)	106 (38.55)		
≥ 3,000	39 (14.18)	14 (5.09)		
Nutrition				
Normal	214 (77.82)	101 (37.83)	6.75	< 0.001
At risk of malnutrition	56 (20.36)	108 (40.45)		
Malnourished	5 (1.82)	58 (21.72)		
Education				
< Middle school	131 (47.64)	108 (41.70)	2.16	0.031
≥ Middle school	144 (52.36)	151 (58.30)		
Fall within 1 year				
Yes	80 (29.20)	90 (33.71)	0.69	0.490
Alcohol				
Yes	111 (40.51)	33 (12.36)	-4.30	< 0.001
Smoking				
Never	192 (70.07)	182 (68.16)	-0.48	0.634
Ex-smoker	73 (26.64)	74 (27.72)		
Current smoker	9 (3.28)	11 (4.12)		
Laboratory				
Hemoglobin (g/dL)	13.64 ± 2.23	12.43 ± 1.79	-4.98	< 0.001
Platelet (103/μL)	223.26 ± 62.41	234.17 ± 78.90	2.39	0.017
Red blood cell (106/μL)	4.68 ± 4.31	4.03 ± 0.59	-2.18	0.030
White blood cell (103/μL)	6.19 ± 1.59	6.67 ± 2.59	1.68	0.094
Albumin (g/dL)	4.41 ± 0.22	4.03 ± 0.45	-6.96	< 0.001
Calcium (mg/dL)	9.26 ± 0.32	9.06 ± 0.56	-3.34	0.001
Blood urea nitrogen (mg/dL)	18.34 ± 5.97	20.07 ± 10.21	0.98	0.329
Creatinine (mg/dL)	0.88 ± 0.26	1.04 ± 0.73	1.09	0.278
C-reactive protein (mg/dL)	2.67 ± 7.37	9.43 ± 22.19	3.89	< 0.001
Erythrocyte sedimentation rate (mm/hr)	15.63 ± 15.35	31.87 ± 29.29	4.63	< 0.001
Glucose (mg/dL)	95.60 ± 19.34	114.58 ± 34.30	4.65	< 0.001

(Continued on the next page)

Table 2. Continued

Components and variables	Urban and rural elderly cohort	Hospital cohort	t or z	p-value
Diseases				
Hypertension (yes)	167 (60.73)	192 (69.82)	0.94	0.346
Diabetes (yes)	67 (24.36)	118 (42.91)	3.05	0.002
Stroke (yes)	15 (5.45)	58 (21.09)	3.32	0.001
Asthma (yes)	15 (5.45)	36 (13.09)	2.30	0.022
Rheumatoid arthritis (yes)	17 (6.18)	8 (2.91)	-1.56	0.118
Depression (yes)	19 (6.91)	56 (20.36)	4.24	< 0.001
Cancer (yes)	32 (11.64)	64 (23.27)	2.08	0.038

Values are presented as number (%) or mean±standard deviation.
MET, metabolic equivalent.

maintain muscle mass, energy, and function; however, the incidence of malnutrition is expected to be high in older adults. The Korean National Survey on the Elderly indicated that nutrition was good for 70.1% of Korea's older adult population, moderate for 19.1%, and poor for 10.8%, which implies that 29.9% of community-dwelling older adults are at risk for malnutrition.[16] In this study, the risk of malnutrition and malnourishment was observed in 22.18% of the community cohort group and 62.17% of the hospital cohort group, indicating a significant difference. This result is in line with that of a previous study that indicated older adults in the hospital setting had the highest risk of malnutrition and those in the community had the lowest risk.[17] Malnutrition has several risk factors in older adults, including biological (i.e., age and frailty), psychological (i.e., loss of interest), and pathophysiological (i.e., diseases, excessive medications) factors, in addition to impaired physical function and swallowing ability.[18] Malnutrition and low albumin are risk factors for sarcopenia,[19] which is a factor associated with frailty. In addition, the co-occurrence of low albumin and sarcopenia may increase the risk of disability.[20] Thus, clinicians must pay attention to nutritional support and prevention of malnutrition in older adults with poor appetite and loss of body weight during hospital visits.

Several studies have reported a high risk of depression in Korea.[9] Specifically, older adults living in Korea have worse physical function, depression, quality of life, and glucose tolerance compared to those in other Asian countries. Our results indicated that older adults who utilized the hospital had a higher risk of depression compared to those in the community cohort. Thus, more attention should be paid to the psychological health of older adults during their hospital visits. Depression is an underrepresented area of health; however, when present, it tends to co-occur with other health problems and has a synergistic effect in causing adverse health outcomes.[21] In the Korean National Survey on the Elderly, the risk of depression was 13.5% but jumped to 41.8% with physical function impairment.[22] Thus, depression is often accompanied by physical health impairment.

Physical function is another predictor of adverse health outcomes in older adults.[23] In line with a previous study,[24] our finding indicated low ADL dependency among older adults in community settings, but much higher dependency in the hospital cohort. In the emergency department, older adults with more ADL dependency and comorbidity tended to be admitted whereas those with less ADL dependency tended to be discharged.[6] Since hospitalization can further increase the risk of functional decline,[25] monitoring the trajectory of functional decline from community to hospital settings is important. At the community level, avoiding a sedentary lifestyle and promoting physical activity are needed to prevent further dependency among older adults.[26] Moreover, early mobilization is necessary in the hospital setting.[27]

Older adults who experience hospital admission have multiple simultaneous health problems related to physiological, psychological, and physical functions. When they visit the hospital with multiple health problems, the CGA can be used to detect potential problems early and guide the development of an optimal, tailored, and person-centered intervention. Ultimately, CGA is useful for predicting mortality and length of hospital stay[7] and improving health outcomes.[8] When the CGA is performed promptly, quality care can be provided to older adults regardless of their context (i.e., community, hospital visit, and hospitalization).

Some limitations of this study need to be noted. First, our study showed that the health status among the two cohorts was different, confirming the fact that older adults visiting hospitals are unhealthy in some domains. Although this finding may not provide new insights, it does provide a comparative analysis in two different cohorts in one study, emphasizing that there is a greater health gap in some areas. Second, the two cohorts used in this study did not recruit older adults on the same continuum (from before hospital use to after hospital use). The heterogeneity of our data is one

Table 3. Results of logistic regression analysis between the two cohort groups (n=427)

Components and variables	OR	SE	z	p-value
Self-rated health (ref: healthy)				
Average	1.38	0.72	0.61	0.539
Unhealthy	1.21	0.55	0.41	0.682
Depression (ref: low risk)				
High risk	2.41	0.94	2.26	0.024
Instrumental activities of daily living (ref: 0 impairment)				
≥ 1 Impairment	2.15	0.81	2.03	0.043
Physical activity (ref: < 600)				
600–3,000 MET	1.31	0.49	0.71	0.476
≥ 3,000 MET	3.70	3.47	1.40	0.163
Timed up and go test (ref: no)				
Yes	0.48	0.41	-0.86	0.388
Nutrition (ref: normal)				
At risk of malnutrition	2.49	1.09	2.09	0.037
Malnourished	6.12	4.47	2.48	0.013
Education (ref: < middle school)				
≥ Middle school	4.12	1.73	3.38	0.001
Alcohol (ref: no)				
Yes	0.15	0.08	-3.41	0.001
Hemoglobin	0.98	0.17	-0.14	0.890
Platelet	1.00	0.01	1.59	0.111
Red blood cell	0.98	0.07	-0.34	0.732
Albumin	0.04	0.03	-4.42	< 0.001
Calcium	2.41	1.53	1.38	0.167
C-reactive protein	1.02	0.02	1.08	0.281
Erythrocyte sedimentation rate	1.02	0.01	2.55	0.011
Glucose	1.05	0.01	4.00	< 0.001
Diabetes (ref: no)	0.33	0.17	-2.16	0.031
Stroke (ref: no)	4.33	2.26	2.81	0.005
Asthma (ref: no)	2.71	1.56	1.73	0.083
Depression (ref: no)	3.15	1.60	2.27	0.023
Cancer (ref: no)	1.96	1.04	1.27	0.203

MET, metabolic equivalent; OR, odds ratio; SE, standard error.

of the limitations of the study, as data was drawn from two different cohorts; older adults using hospitals and older adults living in the community. Since KURE data were collected for other purposes, the existing dataset did not include specific variables—in particular, variables such as socioeconomic status, marital status, and cohabiting family member, which are known to affect the health status related to our research question. Further, information on whether the participants in the KURE cohort visited hospitals was neither collected nor followed up on. Nevertheless, this study attempted to overcome the differences between the two cohorts by ensuring the data collection process for both cohorts was conducted by the same researchers. In addition, internal validity was enhanced by using PSM to consider the differences in demographics and by selecting matched pairs between the two groups.

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CONFLICT OF INTEREST

The researchers claim no conflicts of interest.

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AUTHOR CONTRIBUTIONS

Conceptualization, JYL, KJK, COK; Investigation, JYL, KJK, JEK, YMY, ESS; Methodology, COK; Supervision, COK; Writing_original draft, JYL, KJK; Writing_review & editing, JEK, YMY, ESS, COK.

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