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Factors Influencing Residents' Activities of Daily Living Related to Nursing Staff in Korean Nursing Homes using Path Analysis

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Abstract

Purpose: The purpose of this study was to empirically test a model of associations linking locations and competition among nursing homes (NHs), mediated by facility grade and registered nurse (RN) turnover, on activities of daily living (ADLs) in Korean NHs. Methods: This study used a cross-sectional design to identify causal factors on NH residents' ADLs. Data were collected from June 2017 to August 2017. A disproportionate stratified cluster sampling method of NHs across Korea was used to gain representation. The collected data consisted of location and the Herfindahl-Hirschman Index (HHI), RN turnover rate, facility grade, and NH residents' ADLs. Results: All pathways affecting ADLs were not significant, and the effect on facility grade was significant in RN turnover (β = -.59, p < .001). RN turnover associated negatively with facility grade. In other words, the higher the RN turnover, the worse the facility grade. Conclusion: This study is the first to examine the impact of location and HHIs, mediated by RN turnover rate and facility grade, on NH residents' ADLs. To improve residents' ADLs, subsequent studies are needed to identify the factors affecting ADLs utilizing other variables because this study did not identify factors that affect ADLs.

Keywords: Activities of Daily Living, Nursing Homes, Nursing Staff, Registered Nurse Turnover

1. INTRODUCTION

1.1 Background

The elderly population have trouble with activities of daily living (ADLs), which include very essential tasks such as eating, dressing, toileting, and ambulating [1]. Age and gerontological diseases including dementia and urinary incontinence deteriorated ADLs for nursing home (NH) residents [2]. The Korean government introduced social long-term care insurance for the elderly in 2008, providing services including help with physical activities and support for household activities in long-term care settings like NHs, including home-based nursing care [3]. A total of 174,634 elderly people live in 3,604 NHs in Korea [4]. ADLs are essential everyday tasks that require basic abilities, yet complicate self-care [1]. A person's functional competencies regarding ADLs is a critical factor in NH admission [5]. The meta-analysis reported that a person is about 3 times more likely to receive a NH placement when they have three or more ADL dependencies [5].

In Korea, 8.6% of the elderly population need help with ADLs and approximately 17% experience severe dysfunction in their ADLs [6]. NHs care for older people with chronic diseases and ADL limitations. However, more than 70% of Korean NHs do not employ registered nurses (RNs).

Deteriorated ADLs cause various problems physically, emotionally, and socially in the elderly [7]. Falls can result from difficulties transferring or ambulating, walking, going up and down the stairs, moving in/out of the chair or bed, and using the toilet [1]. The higher the ADL impairment, the higher the degree of depression [8]. ADL limitations lead to depressive symptoms, which increase the risk of suicidal ideation in NH residents [9]. In addition, decreased ADLs lead to cognitive impairment failure in eating independently, which can cause dehydration, malnutrition, weakness, and difficulty getting dressed or going to the bathroom, which can reduce quality of life [1]. Furthermore, ADL dependencies are strongly associated with mortality risk [10]. Therefore, ADLs are important because they are a major issue affecting the elderly's whole quality of life [7].

Nurses play an important role in preventing ADL decline by stimulating NH residents' independence [15]. RNs in Korean NHs experience diverse resident needs ranging from gerontological disease to family members, confusion about different RN roles in NHs (which differ from the role of RNs in hospitals), the untreated status of readmitted residents from hospitals (limited to 10 days of hospitalization), and limitations of visiting doctors and cooperative hospitals [12]. ADL and health outcomes are better when there are more nurses or when nurses have more direct care time with patients [14]. NH RNs assess residents' difficulties with ADLs and encourage step-by-step strategies to motivate the residents [13,14], such as choosing tableware to motivate eating and soap to motivate washing. Also, NH RNs educate and supervise the certified nursing assistant (CNA) and care worker (CW) to perform this role, which is beyond just taking a shower or eating food [13,14]. RNs can provide high-quality nursing care and support residents' ADLs because they are trained to do so [16]. In this light, the role of an RN regarding NH residents' ADLs is more important.

ADL-related studies have been mainly conducted in acute-care settings, focusing on the related physical or cognitive function of elders. Research on the effect of various organizational factors on NH residents' ADLs has also been limited (i.e., facility grade, the Herfindahl-Hirschman Index [HHI]). In Korea, the National Health Insurance Service evaluates NHs' facility grades into five grades (A: Excellent ~ E: Poor) every 3 years [4]. Korean NHs evaluate ADLs by residents' abilities to urinate, eat, dress, groom, walk, and bathe themselves. The facility's grade has an effect on improving the quality of NHs by stimulating health providers [17], and the lower the RN turnover rate, the better the facility's grade [16]. It is reported that a higher value of HHI in NHs results in a higher ADL score [18]. HHI is a common measure of market concentration (the sum of the squares of all the market shares of all NHs in a country) and is used to determine market competitiveness [19]. The higher the value of HHI in NHs, the higher the turnover rate among nursing staff in NHs [20]. Korea has a very unbalanced nurse supply by location, concentrated in urban areas [4]. About 34.7% of nurses working in NHs in 2016 were employed in metropolitan areas [4]. Nurse turnover impacted market factors, including geographical areas [11]. Few studies have reported that RN turnover associates with residents' ADL dependencies [13].

The conceptual framework of this study used the Donabedian model (1966), which has been used as a framework for healthcare quality [24]. The model describes that structure-process-outcome has a synergistic relationship [24]. The structure refers to nursing turnover, the HHI, skill mix of nurse staffing, and outcomes, which refer to the NH residents' ADLs. We attempted to test the impact of structural aspects on nursing outcomes and quality of care on outcomes for NH residents as measured by ADLs.

This study tested associations linking HHI and location (measured by geographic location based on population size) mediated by RN turnover rate and NH facility grade on NH residents' ADLs.

1.2   Research Purpose and Hypothesis

The purpose of this study was to empirically test a model of associations linking each NH's location and competition among NHs, mediated by government NH accreditation quality ratings and RN turnover on ADLs of Korean NH residents. The hypothesized model was tested through path analysis by evaluating the contribution of any path or combination of paths to the overall fit of this model.

The following hypotheses informed this model:
H1: RN turnover influences ADLs
H2: Facility grade influences ADLs
H3: HHI influences ADLs
H4: Location influences ADLs
H5: RN turnover influences facility grade
H6: Location influences RN turnover
H7: HHI influences facility grade
H8: Location influences facility grade.

2. METHODS

2.1   Design

This study used a cross-sectional design to identify factors affecting NH residents' ADLs.

2.2   Sampling and Participants

The parent study of this analysis is the "Estimating optimal nurse staffing for nursing home residents using an optimization model" study from 2017–2020. Data were collected from June 2017 to August 2017. A disproportionate stratified cluster sampling method of NHs across Korea was used. We used the open source by the Long-Term Care Insurance Service website [3] regarding the list of NHs. This website provides each NH's name, administrative district, phone number, bed sizes, long-term care grade, date of establishment, and the number of facility staff including doctors, RNs, CNAs, CWs, and programs in operation. All NHs were stratified according to number of beds (<10, 10~30, >30) and location (metropolitan, medium size, small size, and rural). We randomly selected a total of 476 NHs based on the distribution of NHs across 17 provinces. The project investigator (PI) and researchers contacted the administrators of 476 NHs through visits, phone calls, and emails. Among them, administrators of 60 NHs agreed to participate in this study. Among those 60 NHs, 16 were excluded from the government evaluation because they had just begun operations. Finally, 44 NHs participated in this study. Researchers obtained consent forms and collected data from the NH administrators or RNs through visits.

2.3   Variables

2.3.1 NH Organizational Factors and Resident Data

The collected variables consist of the following: NH characteristics, ownership data, number of beds, operation year, occupancy rate, and affiliation hospital. Data on resident characteristics, age, gender, and long-term care grades were collected.

2.3.2 Location

The location of this study has been classified based on the population in each NH's administrative area. The categories are metropolitan (population > 1 million), medium size (a half million < population < 1 million), small size (population < a half million), and rural (population < 50,000).

2.3.3 HHI

As the distribution of NHs is very unbalanced in Korea (i.e., dense in metropolitan areas), we measured the competition among NHs in the district. The HHI is a common measure of market concentration and is used to determine market competitiveness [19]. The advantages of using the HHI are the simplicity of the calculations needed to determine the HHI and small amount of data needed for such calculations [19]. Choi et al.'s [21] calculation formula was applied to measure NH market concentration in this study. We divided the number of NHs in each participating NH by the total number of NHs in each of the 17 provinces and squared the total for each participating NH.

2.3.4 RN Turnover Rate

We calculated the total HHI for all NHs in each province by summing all values in each province. The possible range of HHI is from 0 to 1. A higher value indicates less competition [19]. We calculated the RN turnover rate using a concept provided by the American Health Care Association [22]. This concept refers to the percentage of all RNs who have resigned in the last year (12 months).

2.3.5 Facility Grade

This evaluation by the Long-term Care Insurance determines each NH's facility grade out of five grades (A ~ E). The evaluation includes a total of 88 indicators about NH management, environment and safety, rights and responsibility, process of NH services, and outcomes [3]. We used 2015 evaluation data in this study because they were the most recent outcomes available to match the collected data.

2.3.6 ADLs

Currently used in North America and internationally, the Minimum Data Set (MDS) provides a comprehensive assessment of the functional abilities of all residents in Medicare- and Medicaid-certified NHs and helps NH staff identify health problems [23]. The MDS includes measures of NH residents' physical, cognitive, and functional statuses and is assessed on hospitalization, quarterly and annual discharge, and whenever there are significant changes in a resident's health status [23]. In this study, we used the ADL questions, which are quality indicators of MDS [23]. ADLs were calculated by the percentage of residents with decreased abilities to conduct ADLs. In this study, decreased ADLs refer to one's decreasing ability to take a bath, change clothes, eat, sit down, walk, and/or use the bathroom in the past 3 months. The NH staff measure residents' ADLs every 3 months. In this study, the percentage of residents with decreased ADLs was investigated through NH administrators or RNs in NHs.

2.4 Data Analysis

We used descriptive and inferential statistics with SPSS 23.0 and AMOS 18.0 to address the study

hypotheses. We used descriptive statistics to explain NH and residents' characteristics. A path analysis was conducted to test our conceptual model that links NH characteristics to ADLs. In this study, the model fit was evaluated using the root-mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis Index (TLI).

2.5 Ethical Consideration

The institutional review board of the first author's affiliated university in Korea approved this study (Approval Number 136-4). We explained the purpose and method of this study to the participants before collecting data. We explained that they retained their right to withdraw from the study at any time. Data were used only for research purposes.

3. RESULTS

3.1 Descriptive Statistics of Participating Organizations

Table 1 summarizes the descriptive statistics of participating organizations (N=44). About half of the NHs (47.7%) were located in metropolitan areas and only 9.1% were located in rural areas. The average HHI was 0.000559 and ranged from 0.000025 to 0.003761. The nursing staff turnover rates are as follows: RNs: 11.7%; CNAs: 10.0%; and CWs: 18.2%. The average percentage of residents with decreased ADLs was 4.5%. More than half (52.3%) of participating organizations received the very best grade (A) in the Korean National Insurance Corporation's regular facility evaluation. No organizations were evaluated as Grade E (unsatisfactory). The average occupancy rate was high (91.26%). The organizations' skill mix ratios are as follows: RN: CNA = 1:1.21; and RN: CW = 1:18.01. In other words, when the ratio of nurses to CNAs is 1:1.21, this means there is 1 nurse and 1.21 CNAs. The ratio of nurses to CWs was 1:18.01, which means there is 1 nurse and 18.01 CNAs. Most organizations (81.4%) were not-for-profit. The average number of beds in participating organizations was 76.20, ranging from 9 to 296. The average operating years was 6.99. Most NHs (90.0%) did not have affiliation hospitals. Residents' average age was 81.78 and the portion of female residents was 79.50%.

### 3.2 Path-Analysis Results on ADLs

Figure 1 shows the pathway that affects ADLs. All pathways affecting ADLs were not significant, and the effect on facility grade was significant in RN turnover (β=-.59, p<.001). RN turnover associated negatively with facility grade. In other words, the higher the RN turnover, the worse the facility grade.

Table 2 shows the model fit. RMSEA was acceptable because it was 0.020 (acceptable value: <.050). CFI was 1.000, which indicated a good fit (acceptable value: >.900). TLI was 1.120, which also indicates a good fit (acceptable value: >.100). Path coefficients in the trimmed model appear in Table 3. One path coefficient was significant at .01. RNs' high turnover rates related negatively to facility grade. In other words, RNs' increasing turnover rates aligned with a decreased facility grade (β= -.59).

Table 1. Nursing Home Characteristics (N=44)

Variable	Frequency (%)	Mean (SD)	Min-Max
Location of Nursing Home			
Metropolitan (>1 million)	21(47.7)		
Medium size (500 thousand–1million)	7(15.9)		
Small size (50–500 thousand)	12(27.3)		
Rural (<50 thousand)	4(9.1)		
HHI		0.000559(0.000857)	0.000025-0.003761
Turnover rate (%)			
RN		11.68(24.00)	0-100
CNA		9.95(19.84)	0-60
CW		18.19(17.38)	0-86
Facility evaluation by the Korean National Insurance Corporation			
A (the very best)a	23(52.3)		
B (excellent)b	8(18.2)		
C (satisfactory)c	6(13.6)		
D (average)d	7(15.9)		
E (Unsatisfactory)e	0(0)		
Occupancy rate		91.26(12.87)	40.00-103.45
Skill mix			
RN: CNA	1:1.21		
RN: CW	1:18.01		
Ownership			
Profit	8(18.6)		
Nonprofit	36(81.4)		
Number of beds		76.20(54.39)	9-296
Operation year		6.99(11.93)	2.00-34.00
Affiliated hospitals			
No	40(90)		
Yes	4(10)		
Decreased of ADLs		4.5	
Age		81.78(11.13)	68-97
Gender			
Female	2432(79.50)		
Male	627(20.50)		

ADLs= activities of daily living; CNA=certified nursing assistant; CW=care worker; HHI=Herfindahl–Hirschman Index; measure of market concentration; RN=registered nurse. a Score of 90 or more, and 70 points or more of each major classification area. b Score of 80 or more, and 60 points or more of each major classification area. c Score of 70 or more, and 50 points or more of each major classification area. d Score of 60 or more, and 40 points or more of each major classification area. e Score of 59 or less, and 39 points or less in each major classification area.
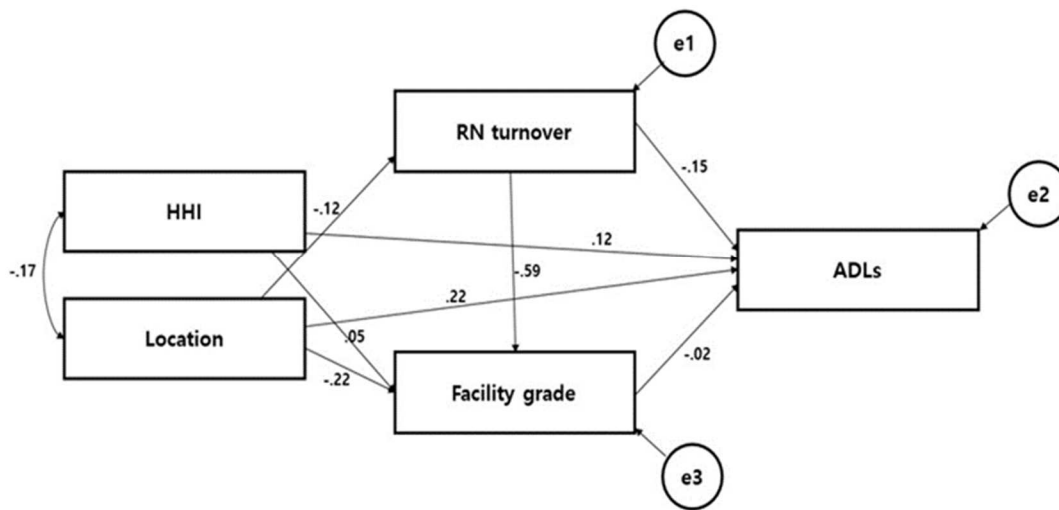
ADLs=activities of daily living; HHI=Herfindahl-Hirschman Index; RN=registered nurse.

Figure 1. Path Analysis on ADLs

Table 2. Model Fit

Indices	NPAR	df	CMIN	CMIN/df	TLI	CFI	RMSEA
Hypothetical model	19	1	.794	.794	1.120	1.000	0.020
Criterion value				≤3	>.100	>.900	<.050

CFI=Comparative fit index; CMIN=chi-square minimum; df=degrees of freedom; NPAR=number of parameters; RMSEA=Root mean square error of approximation; TLI=Tucker-Lewis Index.

Table 3. Regression Weights of Trimmed Model

Items			β	B	SE	C.R.	p
RN turnover	<---	location	-.12	-5860.79	6254.48	-.94	.349
Facility grade	<---	RN turnover	-.59	.00	.00	-4.84	.008
Facility grade	<---	HHI	.05	62.84	165.43	.38	.704
Facility grade	<---	location	-.22	-.25	.14	-1.80	.072
ADLs	<---	HHI	.12	1312.82	1367.90	.96	.337
ADLs	<---	location	.22	2.01	1.21	1.66	.097
ADLs	<---	Facility grade	-.02	-.18	1.46	-.12	.902
ADLs	<---	RN turnover	-.15	.00	.00	-.88	.378

4. DISCUSSION

The path analysis results showed that the higher the RN turnover rate (mediated variable), the lower the facility grade (mediated variable). Much previous research has emphasized the importance of continuous RN staffing; however, it was not sufficient with organizational variables. Conventionally, nurse staffing numbers were predicted by the number of patients and hours per resident day (HPRD) in a fiscal year [25]. NHs predict and adjust the number of nurses on staff; thus, they may under or overstaff, which presents cost problems [26]. Patient mortality decreased in acute-care settings after the enactment of nursing laws in the United States [27]. California had 60% more licensed RNs than other states without nursing laws [28] and showed lower burnout

and dissatisfaction rates with nurses [27]. Eleven states in the United States have nursing laws regarding acute-care settings [29]. The study results are very useful for NH managers or health policymakers seeking to stabilize RN staffing in long-term care settings. The result of this study highlights the importance of stabilizing RN staffing in NHs. Several researchers suggested that the low RN turnover rate in NHs is a decisive factor in improved quality of care, including decreased falls, urinary tract infections, physical restraint use, pressure sores, hospital admissions, and mortality rates [20,30,31]. Harrington and Swan [13] reported that RN turnover associated with residents' ADL dependencies. A low RN turnover rate ensures RNs have a continuous professional observation and familiar relationship with NH residents, consistent supervision over CNAs and CWs, and the ability to properly evaluate NH residents, which affects residents' health outcomes. Although these previous studies reported the importance of a stable supply of RNs in NHs, further studies are needed to determine the cause of this change because this study shows that RN turnover does not affect ADLs. Studies about the effect of RN turnover on facility grade are limited. However, the stability of the RN is very important considering the Korean government's policies to provide incentives to RNs to retain their career in NHs. Nevertheless, the level of financial support to reduce RN turnover is very low [32]. RNs in NHs communicate with other healthcare providers (doctors, social workers, and so on) to establish residents' care plans [33]. Also, RNs are involved in training and supervising nursing staff (CNAs, CWs) and serve as advocators and educators for residents' caregivers [34]. It is time to seek strategic measures to reduce RN turnover because RN turnover affects organizational management, such as costs, the NH's facility grade, residents' health outcomes, and the remaining RNs' workloads. Consistent with previous research [35], the turnover of licensed nurses has a significant impact on the quality of care in each NH. To reduce RN turnover, both individual- and organizational-level effort should be made, including improving NH leadership by stabilizing NH leaders' positions, adding a career ladder for advancement, improving employee benefits, and awarding attendance [36].

Additionally, the stable revenue and financing of each NH may relate to nurse staffing with high turnover rates especially in for-profit NHs [37]. Therefore, we suggest future studies consider NH ownership as another important factor in understanding the quality outcome. For-profit organizations reported worse healthcare outcomes [38]. Ownership may be considered a quality-of-care determinant from several aspects. The government, local subsidies, or funding differ based on ownership. Most studies in the United States reported that for-profit NHs experienced greater financial pressures from stakeholders regarding returns on investment and higher levels of administrative staff salaries [37]. Considering the ADL functions of NHs in Korea that provide diverse care and numerous services by various staff, it is necessary to enhance standardized nursing protocols for assessing and managing ADLs appropriately. NH professional staff should be educated, recruited, and specialized based on organization types, locations, and required services.

This present study has several limitations. First, the 44 NHs concentrated in the metropolitan area around Seoul, which may not represent all NHs in Korea, thus threatening external validity. In other words, there is a limitation in the sample's representativeness. In this study, the proportion of highest facility grade (A) reaches 52.3%, but as a result of the facility grade evaluation nationwide, the proportion of highest facility grade (A) reaches only 31.3%. Therefore, the results should be carefully considered. Future research is required to conduct similar data collection at more NHs. Second, 44 NHs participated in this study and a total of 3,059 residents resided in those NHs. NH was the unit of analysis in this study. There is a different power analysis for individual parameters and entire models. Future research utilizing Satorra and Saris' [39] method for power calculations is required. Third, in this study, several other variables (such as residents' health conditions and NH program for each resident) that could affect ADLs were not controlled. In future studies, it is necessary to control and analyze these variables in consideration. Finally, this study's cross-sectional design restricts the

establishment of causal links between the independent and dependent variables. Future research is required with a longitudinal design to confirm the results.

5. CONCLUSION

This study is the first to examine the impact of location and HHIs, mediated by RN turnover and facility grade, on NH residents' ADLs. Studies on the relationship between RN turnover rate and organizational variables have been insufficient. This study is meaningful because it showed that strategic measures should be sought for RN turnover rates, which affect organizational management such as costs, NH facility grade, and RNs' workload. It also suggests there is a need for policy efforts to increase residents' ADLs by reducing RN turnover rates. To improve residents' ADLs, future studies are needed to identify other factors affecting ADLs, which we did not investigate in this study, including RN turnover, the NH's location, and HHI, because this study did not identify factors that affect ADLs.

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