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ORIGINAL ARTICLE

Ownership of Long-Term Care Facility and Incidence of Pressure Ulcers among Republic of Korea

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Background: In 2008, Korea implemented a new type of social insurance known as "long-term care insurance". We examined the association between ownership of long-term care facilities and the incidence of pressure ulcers after the implementation of "long-term care insurance". This study is a population-based retrospective cohort study from 2006 to 2013.

Methods: We used medical claims data from the Korean National Health Insurance Corporate Elderly Cohort Database from 2006 to 2013. These data comprise a nationally representative sample. To avoid confounders, only patients admitted to one long-term care facility and who stayed for >70% of the follow-up time were included; as a result, 3,107 individuals were enrolled. The main independent variable was the operating entity of the long-term care facility (local government, corporate bodies, and private for-profit owners), and the dependent variable was the 1-year incidence of pressure-ulcers. Survival analysis (Cox proportional hazard model) was used as an analysis method.

Results: Compared to patients admitted to local government long-term care facilities, patients admitted to private long-term care facilities had a significantly higher 1-year risk of pressure ulcers (hazard ratio [HR], 1.94; 95% confidence interval [CI], 1.29-2.91); the risk was especially high among patients who were cognitively dependent (HR, 2.34; 95% CI, 1.25-4.37).

Conclusion: Patients admitted to private for-profit long-term care facilities were more likely to have pressure ulcers compared to those in local government and corporate body long-term care facilities. Appropriate assessment tools and publicly available information, as well as more restricted legal requirements, are needed to improve the care quality and outcomes of patients in long-term care facilities.

Keywords: Long-term care; Ownership; Pressure ulcer

INTRODUCTION

The Korean population is aging; in 2015, elderly people aged over 65 years accounted for 13% of the total population. Accordingly, there has been a rapid increase in the need and use of long-term care facilities in the last few years. Compared to in 2008, when there were only 1,700 long-term care facilities in Korea, in 2015, the number had tripled to 5,085 [1]. This rapid increase was accelerated by changes in the related policies. In 2008, Korea implemented a new type of social insurance known as the 'long-term care insurance', which provides medical and home nursing services to elderly people aged over 65 years and who are physically or cognitively unwell. This insurance is government-funded, and both private individuals and public companies can set up facilities. Therefore, numerous private owners and companies have entered the "long-term care" market by establishing long-term care facilities or providing home nursing services [2,3].

Recently, large variations in the quality of care among long-term

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care facilities in Korea have been reported, with a previous study suggesting that the rapid increase in long-term care facilities has led to these large variations [4]. In particular, there have been many issues regarding the qualitative aspect of the newly established private long-term care facilities. There have been reports that many elderly people are not being provided with high-quality care because of the poor structure, facilities, and personnel, and illegal claims of private nursing homes. However, there are currently few studies analyzing the associations between the characteristics of long-term care facilities and the quality of care [5,6].

Pressure ulcers, also known as "bedsores", refers to skin damage or ulcers caused by ischemia of the skin, subcutaneous fat, and muscles of the pressured area due to blood circulation disorders in the area and the lack of oxygen and nutrient supply when pressure is continuously applied to one part of the body. Usually, when a seriously ill patient is lying on the bed for a long time, it will develop in the area directly touching the floor. It occurs in a person who has been lying for a long time and has no movement, and the area where the bone protrudes does not become blood circulation, so the skin dies due to lack of oxygen and rots. In order to prevent pressure ulcer, the patient or the caregiver needs to constantly change the patient's posture, and thus requires constant care for the patient. Previous studies have shown that the correct clinical protocol can prevent pressure ulcer, and facilities equipped with pressure-relieving mattresses also lower the incidence of pressure ulcer [7].

Therefore, in this study, we aimed to investigate the incidence of pressure ulcers as the primary outcome as a proxy for quality of care. Patients who are physically and cognitively unwell and require help from others, including those who are unable to bathe and who need help transferring, are more likely to have pressure ulcers. Ideally, pressure ulcers should be regularly re-assessed and treated individually [8-10]. We could indirectly investigate if the nursing facility has the correct clinical protocol and facilities through the pressure ulcer.

In this study, we hypothesized that long-term care facilities set up by private for-profit companies or individuals would be associated with a lower quality of care, as indicated by a higher incidence of pressure ulcers.

METHODS

We used medical claims data from the Korean National Health Insurance Corporate Elderly Cohort Database from 2006 to 2013. The Elderly Cohort database contains medical claims data extracted from the Korean National Health Insurance and Long-term Care Insurance. These data comprise a nationally representative sample of claims—approximately 10% of the entire national elderly population—obtained from the medical record data held by the Korean National Health Insurance Corporation (which has data on the entire nation). The specific data used included the details of each patient's utilization of healthcare. To avoid confounders, only patients admitted to one long-term care facility and who stayed for more than 70% of the follow-up time were included; 3,107 individuals met these criteria. This study was approved by the institutional review board of Yonsei University Graduate School of Public Health (2014-239). Because the patients' information was anonymized before the analysis, the need for informed consent was waived.

1. Outcome measures

The main outcome measure was the incidence of pressure ulcers. The following code from the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, was used to identify the incidence of pressure ulcers: pressure ulcer and pressure area (L89).

2. Independent variables

The main variable of interest of this study was the owner of the long-term care facilities. We categorized the owners into three groups: local government, corporate bodies, and private for-profit owners. In Korea, there are four main kinds of owners among long-term care facilities: national foundations, corporate bodies, private owners, and local governments. However, there are few national foundation long-term care facilities, and no patients from these facilities who met the inclusion criteria were identified. Moreover, variables related to the different kinds of long-term care facilities were investigated only since 2008, and we, therefore, analyzed the dataset since 2008; however, we adjusted for the medical history of the patients in the previous 2 years before they were admitted to a long-term care facility,

starting in 2006.

In terms of the covariates, we assessed the general characteristics of the patients, including sex, age (65–75, 75–85, 85–95, or >90 years), income (four quartiles), region (urban or rural), activities of daily living (ADL) dependency (normal, independently living, moderately bedridden, and severely bedridden patients), cognitive dependence assessed by the Korean Dementia Screening Questionnaire (independent, imperfectly independent, partly dependent, and fully dependent), history of stroke (none, subarachnoid hemorrhage, intracerebral hemorrhage, other non-traumatic intracranial hemorrhage, and cerebral infarction), and whether the patient had a bronchus incision, intubation feeding, or catheter. Furthermore, we included the grade of long-term care insurance, which comprises physical function, cognitive function, behavior changes, and nursing treatment. There are five grades, with a lower grade indicate more severe dysfunction of the above items. Although we already included the ADL and cognitive function in the analysis, the long-term care insurance provides different insurance benefits according to the long-term care grade. The ADL and Korean Dementia Screening Questionnaire, which were used for assessment of physical and cognitive function, respectively, have been previously validated [11,12]. Finally, we included the Elixhauser comorbidity index score as a measure of comorbid medical conditions. The Elixhauser index comprises 31 categories of comorbid diseases [13] and allows us to control for certain critical medical conditions that would influence the individual's well-being, such as peptic ulcer disease, paralysis, peripheral vascular disorders, valvular disease, neurological disorders, rheumatoid arthritis/collagen disorders, metastatic cancer, obesity, alcohol abuse, and drug abuse, among others. Herein, we used the Elixhauser index score, which condenses the Elixhauser index into a single numeric score that summarizes the disease burden of the individual [14]. Also, we did subgroup analysis of ADL dependence and cognitive function, because previous study found that patients with cognitive decline were more likely to have pressure ulcers. We investigated association between ownership and pressure ulcer by cognitive dependence (dependent, not dependent).

3. Statistical analysis

The chi-square test was used to calculate the significance of differences in the frequencies and percentages for all categorical variables. Kaplan-Meier curves and the log-rank test were used to assess the relationships between the type of owner of long-term care facilities and the incidences of pressure ulcers. Cox proportional hazard model was used to investigate the relationships between the different long-term care facility owners and incidence of pressure ulcers. All analyses were performed using SAS software ver. 9.3 (SAS Institute Inc., Cary, NC, USA).

RESULTS

Table 1 lists the study participants' general characteristics. There were 744 male and 2,363 female patients. Of the total 3,107 patients, 194, 1,977, and 936 patients were admitted to local government, corporate body, and private long-term care facilities, respectively. Among those patients, 14.4%, 17.3%, and 31.3% developed pressure ulcers, respectively. In terms of ADL dependence, 529, 1,327, 1,200, and 51 patients were classified as "normal," "independent living," "partly bedridden," and "severely bedridden," respectively. In terms of cognitive dependence, 577, 1,194, 1,124, and 212 patients were categorized as "independent," "imperfectly independent," "partly dependent," and "fully dependent," respectively. Eight patients had bronchus incision, 19 patients required intubation feeding, and 80 patients were using a catheter.

Table 2 presents the associations between the type of owner of the long-term care facilities and the 1-year incidence of pressure ulcers. Patients who were admitted to corporate body long-term care facilities had a higher 1-year risk of pressure ulcers compared to those admitted to local government long-term care facilities, although it was not statistically significant (hazard ratio [HR], 1.13; 95% confidence interval [CI], 0.76–1.67). Patients who were admitted to private long-term care facilities had a significantly higher 1-year risk of pressure ulcers compared to those in local government long-term care facilities (HR, 1.94; 95% CI, 1.29–2.91). Furthermore, female patients had a significantly lower 1-year risk of pressure ulcers compared to male patients (HR, 0.48; 95% CI, 0.41–0.56). In terms of ADL dependence, "severely bedridden patients" were significantly more likely to have pressure ulcers in a year compared to "normal" patients

Table 1. General characteristic of participants

Characteristic	Total	Normal	Pressure ulcer	*p*-value
Sex				
Male	744	507 (68.2)	237 (31.9)	<0.0001
Female	2,363	1,937 (82.0)	426 (18.0)	
Age (yr)				
<75	523	451 (86.2)	72 (13.8)	<0.0001
75–85	1,424	1,130 (79.4)	294 (20.7)	
85–95	1,064	799 (75.1)	265 (24.9)	
>95	96	64 (66.7)	32 (33.3)	
Ownership				
Local government	194	166 (85.6)	28 (14.4)	<0.0001
Corporate body	1,977	1,635 (82.7)	342 (17.3)	
Private	936	643 (68.7)	293 (31.3)	
Grade of long-term care insurance				
1 (High)	25	17 (68.0)	8 (32.0)	0.0016
2	1,116	846 (75.8)	270 (24.2)	
3	1,781	1,446 (81.2)	335 (18.8)	
4	118	86 (72.9)	32 (27.1)	
>5	67	49 (73.1)	18 (26.9)	
Income				
Q1 (Low)	1,624	1,347 (82.9)	277 (17.1)	<0.0001
Q2	338	250 (74.0)	88 (26.0)	
Q3	453	336 (74.2)	117 (25.8)	
Q4 (High)	692	511 (73.8)	181 (26.2)	
Region				
Urban	970	753 (77.6)	217 (22.4)	0.3687
Rural	2,137	1,691 (79.1)	446 (20.9)	
Activities of daily living dependence				
Normal	529	445 (84.1)	84 (15.9)	<0.0001
Independent living	1,327	1,079 (81.3)	248 (18.7)	
Partly bedridden patient	1,200	887 (73.9)	313 (26.1)	
Severe bedridden patient	51	33 (64.7)	18 (35.3)	
Cognitive dependence				
Independent	577	471 (81.6)	106 (18.4)	0.2925
Imperfectly independent	1,194	932 (78.1)	262 (21.9)	
Partly dependent	1,124	876 (77.9)	248 (22.1)	
Fully dependent	212	165 (77.8)	47 (22.2)	
Stroke				
Subarachnoid hemorrhage	4	3 (75.0)	1 (25.0)	0.9808
Intracerebral hemorrhage	49	37 (75.5)	12 (24.5)	
Other nontraumatic intracranial hemorrhage	11	9 (81.8)	2 (18.2)	
Cerebral infarction	698	551 (78.9)	147 (21.1)	
None	2,345	1,844 (78.6)	501 (21.4)	
Bronchus incision				
Yes	8	4 (50.0)	4 (50.0)	0.1213
No	3,099	2,440 (78.7)	659 (21.3)	
Intubation feeding				
Yes	19	11 (57.9)	8 (42.1)	0.0529
No	3,088	2,433 (78.8	655 (21.2)	

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Table 1. Continued

Characteristic	Total	Normal	Pressure ulcer	*p*-value
Catheter				
Yes	80	46 (57.5)	34 (42.5)	<0.0001
No	3,027	2,398 (79.2)	629 (20.8)	
Elixhauser index score				
>13	231	184 (79.7)	47 (20.4)	0.2454
6–13	673	524 (77.9)	149 (22.1)	
1–5	775	630 (81.3)	145 (18.7)	
0	1,260	972 (77.1)	288 (22.9)	
<0	168	134 (79.8)	34 (20.2)	
Bed		22.45±18.11	19.29±14.73	
Medical room		1.30±1.26	1.17±1.10	
Total	3,107	2,444 (78.66)	663 (17.78)	

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

Table 2. Association between ownership of long-term care facility and 1-year incidence of pressure ulcers

Variable	Hazard ratio (95% confidence interval)
Sex	
Male	1.00
Female	0.48 (0.41–0.56)
Age (yr)	
<75	1.00
75–85	1.55 (1.19–2.02)
85–95	2.00 (1.53–2.62)
>95	2.71 (1.77–4.17)
Ownership	
Local government	1.00
Corporate body	1.13 (0.76–1.67)
Private	1.94 (1.29–2.91)
Grade of long-term care insurance	
1 (High)	1.00
2	0.80 (0.37–1.70)
3	0.64 (0.30–1.38)
4	1.06 (0.45–2.47)
>5	0.91 (0.37–2.23)
Income	
Q1 (low)	1.00
Q2	1.11 (0.87–1.43)
Q3	1.22 (0.98–1.53)
Q4 (high)	1.22 (1.00–1.48)
Region	
Urban	1.00
Rural	0.98 (0.83–1.15)
Activities of daily living dependence	
Normal	1.00
Independent living	1.30 (1.01–1.67)
Partly bedridden patient	1.76 (1.36–2.27)
Severe bedridden patient	2.75 (1.60–4.71)
Cognitive dependence	
Independent	1.00
Imperfectly independent	1.16 (0.92–1.47)
Partly dependent	1.25 (0.97–1.60)
Fully dependent	1.48 (1.01–2.15)
Stroke	
Subarachnoid hemorrhage	1.07 (0.15–7.74)
Intracerebral hemorrhage	1.01 (0.57–1.80)
Other nontraumatic intracranial hemorrhage	1.05 (0.26–4.27)
Cerebral infarction	1.06 (0.88–1.28)
None	1.00
Bronchus incision	
Yes	0.90 (0.29–2.76)
No	1.00
Intubation feeding	
Yes	2.06 (0.94–4.53)
No	1.00
Catheter	
Yes	1.67 (1.17–2.39)
No	1.00
Elixhauser score	
>13	0.89 (0.65–1.22)
6–13	0.96 (0.79–1.17)
1–5	0.82 (0.67–1.01)
0	1.00
<0	0.86 (0.60–1.23)
Year	
2008	1.00
2009	1.06 (0.78–1.44)
2010	1.18 (0.93–1.51)
2011	1.46 (1.14–1.86)
2012	1.22 (0.96–1.56)
2013	2.34 (1.66–3.28)
Bed	
Per 10 beds	1.01 (0.95–1.07)
Medical room	
Per 1 medical room	0.94 (0.86–1.03)

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(HR, 2.75; 95% CI, 1.60–4.71). Regarding cognitive dependence, patients who were "fully dependent" were significantly more likely to have pressure ulcers compared to "independent" patients (HR, 1.48; 95% CI, 1.01–2.15).

Table 3 presents the subgroup analysis of the association between the type of owner of the long-term care facilities and the 1-year incidence of pressure ulcers according to cognitive dependence. Among patients who were cognitively independent ("independent," "imperfectly independent"), patients admitted to private long-term care facilities were more likely to have pressure ulcers in a year compared to those in local government long-term care facilities (HR, 1.79; 95% CI, 1.04–3.08). Similarly, among patients who were cognitively dependent ("partly dependent," "fully dependent"), patients admitted to private long-term care facilities were more likely to have pressure ulcers in a year compared to those admitted to local government long-term care facilities (HR, 2.34; 95% CI, 1.25–4.37).

Figure 1 presents the Kaplan-Meier curves of the associations between the type of owner of the long-term care facilities and the 1-year incidence of pressure ulcers. Patients admitted to private long-term care facilities showed the lowest pressure ulcer-free rate, as compared to patients admitted to local government and corporate body long-term care facilities.

Table 3. Association between ownership of long-term care facility and 1-year incidence of pressure ulcers by cognitive dependence*

Ownership	Cognitive dependence	
	Dependent	Not dependent
Local government	1.00	1.00
Corporate body	1.35 (0.74–2.45)	1.01 (0.60–1.71)
Private	2.34 (1.25–4.37)	1.79 (1.04–3.08)

Values are presented as hazard ratio (95% confidence interval).
*All covariates are adjusted.

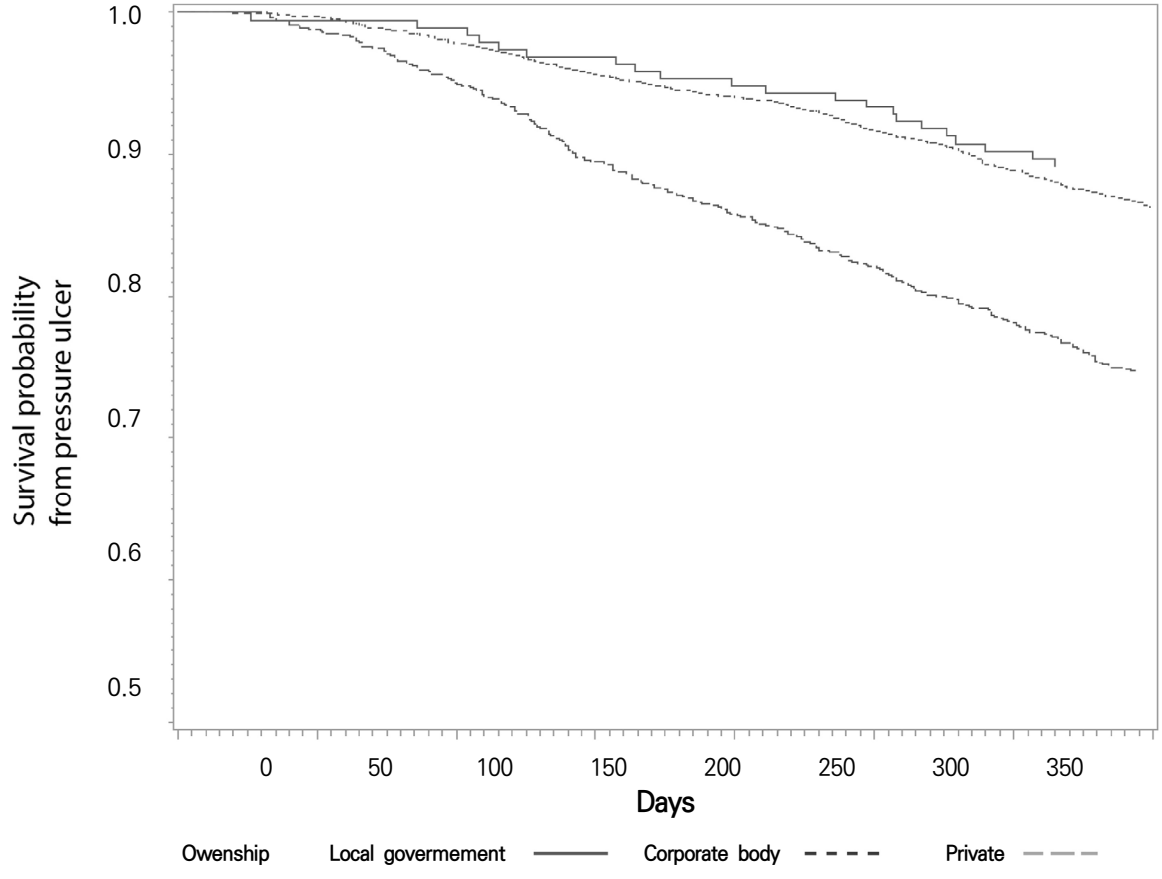

Figure 1. Kaplan-Meier curves of pressure ulcers in 1 year.

DISCUSSION

Many previous studies have investigated the quality of long-term care facilities and found that adequate staffing, along with how many external collaborators the long-term care facility has, the size of the facility, and what type of training the facility manager has, among other factors, were associated with the quality of long-term care [15-17]. Furthermore, other previous studies found that nutritional interventions, medications, staffing patterns, and many other factors of long-term care facilities are associated with the risk of pressure ulcers [18-20]. However, there was need to conduct study that reflexes special circumstances of Republic of Korea. In Korea, there has been a rapid increase of long-term care facility without any restriction or assessment of quality. Recently, assessment tools are developing, but we need to assess which characteristic of long-term care facility affects on quality. This study could be a start by investigating quality of long-term care facility through incidence of pressure ulcer.

Herein, we hypothesized that private for-profit long-term care facilities would be associated with a higher risk of pressure ulcers. Accordingly, our results showed that patients admitted to private for-profit long-term care facilities were more likely to have pressure ulcers (HR, 1.94; 95% CI, 1.29–2.91) compared to those admitted to local government long-term care facilities. Moreover, patients admitted to corporate body long-term care facilities tended to be more likely to have pressure ulcers compared to those in local government facilities, although this was not statistically significant.

This result can be explained by several possible reasons. In Korea, the need for long-term care facilities is quickly increasing along with the increasing elderly population. Therefore, the government has tried to resolve the shortage of long-term care facilities by supporting private long-term care facilities, relaxing the legal requirements for these facilities and by promoting the establishment of long-term care facilities by explaining the conditions and methods to open a long-term care facility [3]. As a result, a rapid increase of private long-term care facilities has been seen in recent years. This leads to a reduction in labor costs due to excessive competition between institutions, which in turn has a structural problem that leads to a decrease in service quality. Also, there are concerns about the low legal requirements and lack of assessment tools. In order to establish a long-term care facility, it is necessary to prepare workers' placement standards and various facility standards. However, smaller size long-term care facilities have easier installation standards, so it is limited in providing quality services. Under 30 bed long-term care facilities, only one doctor and one nurse are required. Although there is a standard for adequate staffing that one caregiver is required for every 2.5 residents, even this is not properly maintained [21]. In 2008, the Health Insurance Corporation confirmed that 62 organizations made illegal claims as a result of local checks against 64 institutions, and unfairly claimed 10% of the amount of 5,331,055 thousand Korean won. It is very difficult to find out without special advice from internal employees or stakeholders because unfair claims are made in secret. Accordingly, we speculate that the lack of appropriate assessment tools together with the low legal requirements and monitoring may have resulted in an unorganized structure and illegal claim, thus reducing the coordinate care and resulting in poorer outcomes among private long-term care facilities [22]. For the same reasons, adequate staffing may not always be provided in private facilities, and prompt individual prevention or treatment of pressure ulcers may consequently not be possible.

The results of our subgroup analysis support this theory. In Table 3, we divided the patients into two groups according to cognitive dependence (independent or dependent). Among patients who were cognitively dependent, the variable of interest was associated with a significantly higher risk compared to in those who were cognitively independent. A previous study found that patients with cognitive decline were more likely to have pressure ulcers [20], and we assume that this is the reason for the result of our subgroup analysis. In other words, patients with cognitive dependence admitted to private long-term care facilities have a higher risk of pressure ulcers because they are more easily affected by the lower quality of the preventive and coordinate care. Nevertheless, despite this result, the increase of private for-profit long-term care facilities is inevitable owing to the ageing Korean population. However, we now have to consider the care quality and outcomes associated with this increase.

First, appropriate quality assessment tools are needed. In fact, since 2009, the Korean government has performed regular quality assessments every 2 years. However, these assessment tools are too lopsided to structure. There are 98 assessment items, but only five of them are concerning direct outcomes. Moreover, some authors have

reported that these items are not sufficiently specific or specialized [23,24]. To ensure good quality in every long-term care facility, assessment tools focused on the outcomes of the patients are needed. Second, the assessment results should be made public and should be easy to access by everyone, including the social media platforms. It would be much more effective if the elderly patients or their families could easily find out which long-term facilities are consistently providing high-quality care. Finally, the legal requirements of the owners of long-term care facilities should be more restricted. In Korea, a declaration system is currently used for the owners. However, a permit system with more restricted legal requirements would result in better quality of care and outcomes of the patients. Thus, while patients in private long-term care facilities are currently more likely to have pressure ulcers, this may simply be a temporary outcome during the transition period if the above points are taken into consideration.

This study has some limitations. First, because of the small number of patients who were admitted to only one long-term care facility during the study period, we were unable to further divide the patients into groups with more homogeneous comorbid diseases. However, to minimize this limitation, we included the physical function, cognitive function, history of different kinds of stroke, and the Elixhauser index score, as well as several nursing treatments such as bronchus incision, intubation feeding, and catheter use, as covariates in our analyses. Second, we were unable to assess the results of previous assessment tools for long-term care facilities and could not adjust the results according to these factors. Therefore, we could not consider the variation between long-term care facilities directly by considering quality scale or information of staff such as doctor, nurses, and caregivers. However, to adjust the institutional features and scale of institution, we include number of beds, and number of medical rooms in the model. Third, we used only pressure ulcer as proxy for quality of care. Further studies are needed to investigate association between ownership and other quality measures. Fourth, we only had data until 2013, so we could not investigate recent trend and association of the results. Further studies are needed to investigate whether incidence of pressure ulcer in private long-term care facilities are improving or not Finally, we were unable to adjust for the detailed characteristics of the long-term care facilities such as the number of staff members and medical equipment.

Nevertheless, our study also has some important strengths. First, to our knowledge, this study is the first to investigate the association between different types of owners of long-term care facilities and the incidence of pressure ulcers in Korea. Second, our data are nationally representative, because the dataset represent a sample of 10% of the medical record data from the entire nation. Finally, we used an 8-year longitudinal dataset, thereby allowing for a highly accurate analysis.

In conclusion, patients in private for-profit long-term care facilities are more likely to have pressure ulcers compared to those in local government and corporate body long-term care facilities. Appropriate assessment tools, publicly available information, and more restricted legal requirements are needed to improve the care quality and outcomes of long-term care facilities in Korea.

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