Determinants of Nursing Home Quality*

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Abstract: This study explores the determinants of nursing home quality, providing a theoretical framework that takes into account structural, process, and environmental factors. It asks: Do structural, process, and environmental factors influence nursing home quality? If so, which is the strongest predictor of quality? And does market competition have a positive impact on nursing home quality? Based on relevant literature, this study developed hypotheses and tested them with multiple regression models. The models show that most (but not all) structural, process, and environmental variables have a statistically significant relationship with nursing home quality. The ratio of nursing assistant hours to total nursing hours has the strongest positive influence on quality of care. But market competition does not have a positive effect on nursing home quality; this implies that competition may not a good way to improve the quality of nursing home care.

Keywords: market competition, nursing home quality, organizational ownership type

INTRODUCTION

Nursing homes have seen considerable growth in the past four decades. Among the major reasons for this are the aging of the population, the prevalence of chronic diseases, and the growing prevalence of the nuclear family. Nursing home services have some characteristics that distinguish them from other services. First, beneficiaries are often unable to make an independent selection. Due to mental or physical impairments, residents do not perceive themselves as actively involved in the choice of nursing home care (Castle, 2005). Thus, residents' family members or friends play an important role in selecting a nursing home. Second, nursing home services often require long-term care. Thus, it is difficult to expect a visible effect of care in a short time. Thus, nursing

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homes need to have qualified nursing staff for continuous resident care and maintain active interactions between nursing staff and residents.

Service quality has come to the forefront in nursing home studies. It is defined as "consistent delivery of services that maximize the physical, mental, social, and spiritual well-being of all patients, produce desirable outcomes, and minimize the likelihood of undesirable consequences" (Singh, 2005, p. 616). Although the issue of service quality has been studied for 40 years, many studies have not provided a comprehensive theoretical framework for understanding nursing home quality (Sainfort, Ramsay, & Monato, 1995; Unruh & Wan, 2004; Wan, Zhang, & Unruh, 2006).

Past studies mainly explained the quality of care in terms of structural factors—that is, professional and organizational resources available to support the provision of care. But nursing home quality has multidimensional characteristics that cannot be explained by structural factors alone. Process factors, including efforts and activities that are necessary for providing high quality care, and environmental factors, including social and environmental supports, also influence nursing home quality. Unruh and Wan (2004) emphasize the significance of environmental factors in particular. Considering that nursing home quality can be improved with social and environmental supports, there is no question that environmental factors play an important role in improving nursing home quality.

This study provides a comprehensive theoretical framework that uses structural, process, and environmental factors (SPE factors) to explain nursing home quality. It asks three research questions. First, do SPE factors influence nursing home quality? Second, which variable among the SPE factors is the strongest predictor of nursing home quality? Third, does market competition (a key environmental factor) have a positive impact on nursing home quality?

To answer these questions, this study presents research in several steps. First, it explains SPE factors influencing the quality of care in nursing home services. Second, it reviews data from the Online Survey, Certification, and Reporting (OSCAR) system for nursing homes in the United States and develops hypotheses about the relationships between the SPE factors and nursing home quality. Third, it provides multiple regression models for determinants of nursing home quality and analyzes their results. Finally, it assesses the models, discusses their implications for nursing home quality, and concludes with a brief discussion of the study's limitations.

THEORETICAL FRAMEWORK

Structural Factors

Most studies on nursing home quality have focused on the influence of structural factors. *Structure* refers to relatively stable features that affect the ability to deliver services (Davis, 1991, p. 130). It generally includes professional and organizational resources that are available to provide services—such as nursing staff, ownership type, bed number, and resident mix.

Nursing staffs usually include registered nurses (RNs), licensed practical nurses (LPNs), and nursing assistants (NAs).[1] The relationship between nursing staff and service quality has been widely studied. A large number of empirical studies have found that licensed nursing staffs, such as RNs and LPNs, have a positive effect on nursing home quality (Bliesmer, Smayling, Kane, & Shannon, 1998; Cohen & Spector, 1996; Harrington & Zimmerman et al., 2000; Kanda & Mezey, 1991; Munroe, 1990; Nyman, 1988; Wan, 2003). Bliesmer et al. (1998) find that higher licensed nursing hours per resident day are associated with a higher quality of care, indicating a higher rate of discharges and a lower rate of deaths. But NAs as nonlicensed nursing care providers are not statistically significant in the discharges and deaths. Cohen and Spector (1996) examine the effect of nursing staff on service quality measured by mortality, bedsores, and functional status, and they find similar empirical results. While more RN and LPN hours per 100 residents have a positive effect on quality of care by reducing mortality and bedsores, more NA hours per 100 residents do not have a positive impact on nursing home quality.

But most care for residents in nursing homes is performed by NAs. In particular, NAs play an important role in residents' care by assisting with feeding (Harrington & Kovner et al., 2000). Based on OSCAR staffing data for 14,140 nursing homes for 1997, the average ratio was 0.72 RN hour (43.2 minutes) per resident day, 0.69 LPN hour (41.4 minutes) per resident day, and 2.10 NA hours (126 minutes) per resident day. The total nurse staffing time per resident day was 3.51 hours (210 minutes). On average, RNs provide 20.6 percent of total nursing hours, LPNs 19.7 percent, and NAs 59.7 percent (Harrington & Carrillo, 1999). For this reason, it might reasonable that

1. RNs have two to six years of professional training, and LPNs have one year; both must be licensed in the state where the nursing home is located. NAs are in the first four months of employment and are receiving training in a state-approved training and competency evaluation program; CNAs (certified nursing assistants) have completed the program. This paper hereafter uses the term NA to refer to both NAs and CNAs.

the impact of nurse staffing levels on service quality is measured more by NA hours than by RN and LPN hours.

Ownership type is a critical structural factor influencing nursing home quality because quality largely depends on the capacity of service providers. An extensive empirical literature has compared quality between for-profit and nonprofit nursing homes, but these studies did not yield consistent findings. Some found higher quality among nonprofit nursing homes, while others found no significant quality differences or mixed results.

Proponents of nonprofit nursing homes argue that the voluntary spirit of nonprofit organizations contributes to an improvement of quality for residents who require relatively long-term care. Several empirical studies have found that nonprofit nursing homes provide a higher quality of care than their for-profit counterparts (Aaronson, Zinn, & Rosko, 1994; Amirkhanyan, Kim, & Lambright, 2008; Chou, 2002; Greene & Monahan, 1981; Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001; Hawes & Phillips, 1986; Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005; Spector, Selden, & Cohen, 1998).

Some studies find that there are no significant differences between for-profit and nonprofit nursing homes in the quality of care. O'Brien, Saxberg, and Smith (1983) review previous literature on the effect of organizational ownership on nursing home quality, focusing on the comparison between for-profit and nonprofit nursing homes. They conclude that both for-profit and nonprofit nursing homes have relative advantages so that it is difficult to generalize research results.

Some empirical studies on the subject are inconclusive (Bliesmer et al., 1998; Castle & Shea, 1998; Cohen & Spector, 1996; Gertler, 1992). These studies do not show a consistently higher quality of care in nonprofit nursing homes or a consistent relationship between ownership and quality. A major reason for the inconsistent empirical results of these studies is that the studies used different variables to measure quality. Thus, Spector et al. (1998) argue that a comprehensive set of quality indicators is necessary to understand fully the relationship between ownership and quality.

Generally, in situations in which there is not enough information to accurately evaluate the quality of a service, consumers tend to prefer services provided by nonprofits rather than for-profits (Hansman, 1987). The reason is that consumers believe that nonprofits are more trustworthy and deliver better services because of their voluntary mission. Nonprofit organizations may have a competitive advantage in evaluating service quality because the lack of a profit motive may motivate honest behavior by the nonprofits, ensuring that they deliver the promised level of service quality (Grabowski & Hirth, 2003).

A nursing home aims to recover the health of economically indigent or elderly

patients through the provision of good services. Thus, it listens to the responsiveness of patients to provide a better service quality and emphasizes the voluntary labor of nursing staff to take care them. Furthermore, considering a situation in which patients do not have full information to evaluate the quality of nursing homes, it is reasonable to expect that nonprofit nursing homes provide a better quality of care than their for-profit counterparts.

Past studies on the impact of ownership type on nursing home quality have paid little attention to the effect of public nursing homes owned by local governments. Many of the studies have grouped public and nonprofit providers together and have not looked at public providers separately. Generally, public organizations tend to have a higher mission, which generates a higher staff motivation than private organizations. This organizational characteristic eventually may lead to higher levels of service quality (Rainey & Steinbauer, 1999). Empirical evidence also shows that public nursing homes owned by local governments have a positive effect on the quality of care, although this does not have consistent statistical significance in all quality measures (Amirkhanyan et al., 2008; Ben-Ner & Ren, 2008; Zhang & Grabowski, 2004).

Size, or the occupancy capacity of a nursing home, is usually measured by the number of beds. Previous studies have had mixed findings on the relation between number of beds and service quality. Some studies find that the number of beds has a positive effect on service quality because nursing homes having more beds provide a wider scope of services (Greene & Monahan, 1981; Riportella-Muller & Slesinger, 1982). But this relationship is possible only if a nursing home has sufficient human and financial resources. At larger nursing homes, more personalized care of residents and the provision of a better environment may make it difficult to provide the better quality of care dues to lack of human and financial resources. As a result, larger nursing homes are more negatively or insignificantly associated with service quality (Nyman, 1988; Wan et al., 2006; Zinn, Aaronson, & Rosko, 1993).

Overall, it seems that an increase in the number of beds has the potential to improve service quality by providing more services. An important condition of this assumption, however, is the presence of trained professional staff who can provide residents with skilled services. Thus, the number of beds has a positive effect on the quality of care only as long as nursing staff and financial resources can provide patient care. Considering that many nursing homes suffer from lack of professional nursing staff, such as RNs and LPNs, it does not seem likely that an increase in the number of beds will be positively associated with service quality.

One of the popular components reflecting resident characteristics is resident case mix. It is often measured by the Activities of Daily Living (ADL) Index, which measures residents' need for assistance with basic self care. Past studies on the effect

of case mix on service quality have shown mixed results. While some find that there is a negative association between the ADL Index and service quality (Grabowski, 2001; Harrington & Woolhandler et al., 2001), others do not find that there are statistically significant relationships between the two (Harrington et al., 2000; Johnson-Pawlson & Infeld, 1996).

Medicaid recipients account for approximately 50 percent of all nursing home expenditures (Short, Kemper, Cornelius, & Walden 1992). The introduction of the Medicaid program also has brought a shift from government to private-sector ownership. The Medicaid program gives financially indigent individuals access to nursing homes by a direct reimbursement to the nursing home. Nursing homes are assumed to provide the same level of quality to both private payers and Medicaid recipients, because the law does not allow any discrimination in the provision of health care services based on the source of payment (Gertler, 1992). But for some nursing homes, having a high proportion of Medicaid recipients does not provide sufficient resources to provide high service quality. This may be related to a decrease in motivation for improving nursing home quality.

Generally, prices charged to private-pay residents are higher than those for public-pay residents (Cohen & Spector, 1996). Private payers tend to require a higher service quality that corresponds to their price. To respond to their requirements, nursing homes try to improve service quality. An increase in the proportion of Medicaid recipients results in a relative decrease in private-pay residents, and thus it may be negatively associated with service quality (Aaronson, et al., 1994; Gertler, 1992; Harrington & Swan, 2003; Nyman, 1988; Zinn, 1994).

Process Factors

Despite their importance, process factors have not been extensively explored in the study of nursing home quality due to difficulties in finding appropriate indicators to measure them. Nevertheless, considering a basic assumption that processes involved in good health care are positively associated with improvement of nursing care quality, it is valuable to examine the relationships between process factors and the quality of nursing care. This study focuses on three process factors that have been widely used in the literature: comprehensive care plan deficiency, physical restraints, and rehabilitative care services.

A comprehensive care plan describes the entire effort by a nursing home to improve the quality of care, with measurable objectives and timetables. It provides a guideline for improving nursing care and a systematic analysis of current circumstances. Deficiency means that a nursing home fails to meet a federal or state requirement, and it

reflects the inadequacy of nursing care provided by the home. Therefore, it is reasonable to expect that severe comprehensive care plan deficiencies have a negative impact on nursing home quality.

The use of physical restraints is most commonly cited by researchers as a process factor (Castle, 2005; Hillmer et al., 2005). Physical restraints are defined as devices, material, or equipment that is attached to or adjacent to the patient's body, prevents free bodily movement, and cannot be controlled or easily removed by the patient (Stilwell, 1988). Nursing homes use physical restraints to protect the facility from liability, protect residents from falling, or from hurting themselves while agitated, and protect other medical devices (Miles & Irvine, 1992).

Immobility resulting from the use of physical restraints generates potentially negative consequences for residents' health. In particular, it increases the likelihood of pressure sores, infection, mortality, or mental depression (Lofgren, MacPherson, Granieri, Myllenbeck, & Sprafka, 1989; Miles & Irvine, 1992; Mion, Frengley, Jakoveic, & Marino, 1989; Zinn, et al., 1993). For this reason, physical restraints may be negatively associated with service quality.

Rehabilitative care services provide residents with continuous care and treatment. They have generally improved the quality of nursing home care (Wan et al., 2006). In particular, frail residents may benefit from appropriate rehabilitative care services. Considering that most residents in nursing homes need special rehabilitative care, these services play an important function in improving the quality of care.

Environmental Factors

Market competition is a key environmental factor. A growing body of research has studied whether market competition within a specific service among different organizational ownerships—such as for-profits, nonprofits, and governments—influences service quality. Despite the significance of market competition, however, there is little empirical evidence on how it influences service quality. Most studies have focused on differences in quality rather than on the reasons for the differences.

Previous studies have had mixed findings about the relationship between market competition and service quality. Some find that nursing home quality is higher in more concentrated markets than in competitive markets (Zinn, 1994; Zinn, et al., 1993). Others have found that market competition has a positive impact on service quality (Grabowski, 2001; Grabowski & Hirth, 2003). Their argument is that market competition motivates service providers to respond to consumer demands, and that this creates a synergistic effect that results in better service quality.

One reason for these mixed results is that the studies used different variables to

measure service quality, which could generate different findings about the relationship between two variables. Another reason is related to whether market competition was controlled properly with other structural factors or not. As one example, the number of Medicaid recipients may influence market competition. If nursing homes are located in markets with excess demand for services provided to Medicaid recipients, they face less competition because there is little incentive to provide Medicaid recipients with a high quality of care.

I argue that a mix of for-profits, nonprofits, and governments in the nursing home industry increases the likelihood for competition among these organizational ownerships. Generally, when market share is concentrated in a few large organizations, competition tends to be diminished. Organizations that command a large share of the market are likely to dominate the production of the goods or services provided, and they tend to decide the price of those goods or services. Under this circumstance, it is difficult to expect improvement in service quality. If this argument is true in the nursing home industry, market concentration may be negatively associated with service quality. In contrast, competition encourages service providers to provide a better service quality.

Many nursing home consumers do not have enough information to adequately assess quality. Under this circumstance, nonprofit nursing homes may serve as a credible provider of quality to poorly informed consumers by showing that they have more incentives to provide high-quality care than for-profit nursing homes. Hirth (1999) argues that an increase in nonprofit market share helps improve for-profit nursing home quality as well as overall nursing home quality through a competitive spillover effect. Some empirical studies find that nonprofit market share has a positive effect on both for-profit and overall nursing home quality (Grabowski & Castle, 2004; Grabowski & Hirth, 2003; Hirth, 1999).

Nursing homes primarily aim to care for elderly people who have physical and mental impairments. People over the age of 65 are a major target group for nursing homes. Previous studies have had different findings on the relationship between elderly population and service quality. While some find that population over the age of 65 is negatively associated with nursing home quality or does not have an impact on it (Cohen & Spector, 1996; Spector et al., 1998), others find that it is positively associated with service quality (Amirkhanyan et al., 2008; Wan et al., 2006; Zinn, Aaronson, & Rosko, 1993). These different results partly stem from the use of different variables to measure service quality. For example, some studies used the proportion of urinary tract infections to measure the quality of care. In the studies, the population over the age of 65 was negatively associated with nursing home quality or did not have an impact on it. This result might stem from the fact that a major target group for treatment of urinary tract infections is not necessarily the elderly population. In fact, many male

and female residents under 65 years old also suffer from urinary tract infections. But, considering that nursing homes should promptly respond to the demands of target groups such as elderly people, it is reasonable to expect that there is a positive association between elderly population and service quality.

Nursing homes located in a wealthy region face a greater demand for a higher quality of care because self-paying residents with high incomes living in such a wealthy region tend to select a nursing home providing high-quality care (Unruh & Wan, 2004). In contrast, nursing homes located in regions where the proportion of the low-income population is high may have fewer incentives for providing patients with better service quality because most patients do not have the financial ability to demand it. Thus, the proportion of low-income population may have a negative impact on the quality of care.

The urban vs. rural location of nursing homes is commonly used as an environmental factor, but it does not appear to have been thoroughly examined. Previous studies have found that the urban-rural location has little or no impact on nursing home quality (Cohen & Spector 1996; Spector et al., 1998; Wan et al., 2006). Self-paying high-income patients are more likely to reside in urban areas; thus, they tend to select nursing homes located in urban areas. Nursing homes in urban areas try to provide self-paying patients with better service to respond to their demand for a high quality of care. This effort makes it possible for nursing homes in urban areas to compete with other nursing homes, and this competition ultimately may lead to improved nursing home quality.

RESEARCH METHOD

Data Collection and Sample Description

The primary data source for this study is the OSCAR system database, which contains information about nursing homes certified federally for Medicare and Medicaid in the United States. The certified nursing homes covered by the OSCAR data represent about 96 percent of all nursing homes nationwide (Grabowski & Hirth, 2003). State survey agencies are responsible for entering survey information for each nursing home no later than every 15 months in the OSCAR database to verify whether it is in compliance with federal regulatory requirements.

The data for this study were collected in 2004 for federally certified nursing homes participating in both Medicare and Medicaid. If a nursing home was surveyed multiple times during this interval, the most recent survey results were included in the data set. In order to eliminate extreme outliers, this study excludes nursing homes that had 15

or fewer residents (Harrington & Zimmerman et al., 2000; Wan et al., 2006), did not participate in both Medicare and Medicaid, and did not record nursing staff hours. After those exclusions, the final sample included 12,740 nursing homes. Of these, for-profits account for 69.86 percent of the sample (8,900 nursing homes), nonprofits for 25.53 percent (3,253 nursing homes), and government-owned nursing homes for 4.61 percent (587 nursing homes). Unlike studies that utilize a sample from a single state, this study includes nursing homes from all 50 states. This permits a more complete examination and generalization of research results.

Dependent Variables

How to measure nursing home quality is a critical issue. Although quality has been measured using a number of indicators, there are no generally accepted measures at present (Rantz, Flesner, & Zwygart-Stauffacher, 2010). Each measure has its advantages and disadvantages. In this regard, it is reasonable to maximize the appropriateness of a quality measure and to minimize its weaknesses. In this study, quality variables were selected based on their availability in the OSCAR data, frequency of use in previous studies, and relatively high prevalence (Castle, 2005). Three quality measures were selected: pressure sores, feeding tubes, and indwelling catheters.

Pressure sores are the most commonly used quality indicator. They are a good measure of quality because they are preventable and treatable (Kane, Ouslander, & Abrass, 1989). Feeding tubes and indwelling catheters are also good measures for identifying functional decline and need for assistance. Pressure sores, feeding tubes, and indwelling catheters are all negative measures of quality—higher rates mean a lower quality of resident care. They are measured by the proportion of residents affected.

Structural Variables

Nurse Staffing Level

Nursing staff is an important human resource influencing nursing home quality. As mentioned earlier, most care for residents in nursing homes is provided by NAs, not RNs and LPNs. Therefore, it is a key to improving service quality that NAs take many hours for residents' care. Thus, this study expects that higher NA hours will be associated with a higher quality of care and a lower proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, nurse staffing level is measured by the ratio of NA hours to total nursing hours per resident day. This measurement is more valid than NA hours alone (Munroe, 1990).

Ownership Type

Generally, the relationship between ownership type and nursing home quality focuses on whether quality differs between for-profit and nonprofit nursing homes. The managerial objective of for-profit nursing homes is profit maximization. This objective may lead managers to favor financial returns at the expense of improving service quality. On the other hand, nonprofit nursing homes are not bound by profit distributions because net revenues are used to improve service quality for residents. Based on these different organizational characteristics, this study expects that nonprofit nursing homes will be associated with a higher quality of care than for-profit and public (government-owned) nursing homes. In this study, nonprofit nursing homes are measured as a dummy variable coded 1 if a nursing home is owned by a nonprofit organization and 0 otherwise.

Public organizations often participate in the provision of services, which have the characteristic of public goods such as a nursing home. Their high missions and service motivations may lead to higher levels of service quality. Thus, comparing public and non-public nursing homes, this study expects public nursing homes will be associated with a higher quality of care than their non-public counterparts. In this study, public nursing homes are measured as a dummy variable coded 1 if a nursing home is owned by a local government and 0 otherwise.

Number of Certified Beds

As mentioned earlier, a positive effect of the number of beds on nursing home quality is only possible if a nursing home has sufficient nursing staff to care for residents. An increase in the number of certified beds that does not consider the capacity of nursing staff for providing skilled care services may be negatively associated with the quality of care. Based on this assumption, this study expects that a larger total number of certified beds in a nursing home will be associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, the number of certified beds is measured by the total number of certified beds per nursing home.

Activities of Daily Living (ADL) and Proportion of Medicaid Recipients

Studies have shown that the ADL Index is associated with quality of care (Grabowski, 2001; Harrington et al., 2001). This index ranks five categories: bathing, dressing, toileting, transferring, and eating. The OSCAR data report need for assistance for each

of these categories. The ADL Index score is usually calculated by summing the scores for the five ADLs; a higher ADL score is associated with a poorer quality of care. This study expects a higher ADL score will be associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter.

Nursing home residents consist of private payers and public payers. Most of the public payers are Medicaid recipients, for whom nursing home services are directly reimbursed by Medicaid. Generally, prices charged to private-pay residents are higher than those for public-pay residents (Cohen & Spector, 1996). Private payers tend to require a higher quality of care that corresponds to their price. To respond their needs, nursing homes try to improve the quality of care. Accordingly, an increase in the proportion of Medicaid recipients results in a relative decrease in private-pay residents, and thus it may be negatively associated with nursing home quality.

Previous empirical studies have suggested that a high proportion of Medicaid recipients would have a negative influence on the quality of care (Aaronson et al., 1994; Gertler, 1992; Harrington & Swan, 2003; Nyman, 1988; Zinn, 1994). Based on these results, this study expects that a higher proportion of Medicaid recipients will be associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter.

Process Variables

Comprehensive Care Plan Deficiencies

Comprehensive care plan deficiencies can be understood as inadequately providing a comprehensive guideline for improving nursing care. Such deficiencies may make it difficult to establish the systematic and objective plans that are necessary for improving the quality of care. For this reason, the severity of deficiencies cited in the comprehensive care plan may have a negative impact on nursing home quality. Therefore, this study expects that a high level of deficiencies cited in the comprehensive care plan will be associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter. The OSCAR data categorize the severity of each deficiency based on the scope and the level of harm generated by the deficiency.[2] In this study, the severity of deficiencies cited in the comprehensive

2. The severity category codes are as follows: A = isolated/potential for minimal harm, B = pattern/potential for minimal harm, C = widespread/potential for minimal harm, D = isolated/minimal harm or potential for actual harm, E = pattern/minimal harm or potential for actual

care plan ranges from 1 to 12, with higher values signifying a more severe level of deficiencies cited.

Physical Restraints

Physical restraints are an important process factor influencing service quality because they are associated with an increased risk of several measures of quality of care such as pressure sores, morbidity, mortality, and infection. Lower levels of physical restraints are generally associated with higher quality of care (Grabowski & Castle, 2004). Thus, this study expects physical restraints are associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, physical restraints are measured by the proportion of residents with physical restraints in each nursing home.

Rehabilitative Care Service

Rehabilitative care services provide residents with a good opportunity to recover their health. For rehabilitative care to succeed, conditions such as adequate staff and facilities must be satisfied. Through these services, residents can expect that their health will improve with a high quality of care. Therefore, this study expects that rehabilitative care services will be associated with a higher quality of care and a lower proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, rehabilitative care service is measured by the number of specialized rehabilitation beds per nursing home.

Environmental Variables

Market Competition

A mixed market of for-profit, nonprofit, and government-owned nursing homes increases the likelihood of competition to provide services of better quality. Previous empirical studies found that market competition among different nursing home providers had a positive impact on nursing home quality (Grabowski, 2001; Grabowski

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harm, F = widespread/minimal harm or potential for actual harm, G = isolated/actual harm, H = pattern/actual harm, I = widespread/actual harm, J = isolated/immediate jeopardy to resident health or safety, K = pattern/immediate jeopardy to resident health or safety, L = widespread/immediate jeopardy to resident health or safety.

& Hirth, 2003). Based on these results, this study expects that market competition will be associated with a higher quality of care and a lower proportion of residents having pressure sores or using a feeding tube or indwelling catheter.

The Herfindahl Index is often used to measure market competition and its opposite, concentration. It is constructed by summing the squared market shares of all nursing homes in each county. It ranges from 0 to 1, with higher values signifying greater concentration and less competition. A score below 0.1 indicates low concentration, between 0.1 and 0.18 indicates moderate concentration, and above 0.18 indicates high concentration.

Nonprofit Market Share

Although the effect of ownership type on nursing home quality is usually measured as a dummy variable of for-profits or nonprofits, such a measurement does not fully capture its effect. As an alternative, a measure of nonprofit market share may help to fill this gap. Empirical studies have shown an increase in nonprofit market share to be positively associated with both for-profit and overall nursing home quality through a competitive spillover effect (Grabowski & Castle, 2004; Grabowski & Hirth, 2003; Hirth, 1999). Accordingly, this study expects that a higher nonprofit market share will lead to a higher quality of care and a lower proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, nonprofit market share is measured as the proportion of nonprofit nursing homes within a county.

Population over the Age of 65

People over the age of 65 are major consumers of nursing home services. A higher proportion of elderly people in a county increases the likelihood of disease, which may increase the demand for nursing home care. Considering that nursing homes should promptly respond to the demand of their target groups, such as elderly people, this study expects that a higher proportion of individuals who are over the age of 65 in a county will be associated with a higher quality of care and a lower proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, elderly population is measured by the proportion of individuals who are over the age of 65 in each county.

Low-Income Population

Nursing homes located in affluent areas are likely to include more private-pay

residents than Medicaid recipients because private payers generally have a higher income. Nursing homes compete with each other to provide better quality for private-pay residents (Nyman, 1988). But residents of nursing homes located in areas with a high proportion of low-income people are mostly Medicaid recipients.

Medicaid recipients tend to be unhealthier and less informed and thus do not have a great willingness to pay for quality of care. For this reason, nursing homes located in areas where the proportion of low-income people is high may have less motive to improve service quality. Thus, this study expects a higher proportion of low-income people in a county will be associated with a lower quality of care and a higher proportion of residents having pressure sores or using a feeding tube or indwelling catheter. In this study, low-income population is measured by the proportion of households in a county with an annual income of less than $15,000.

Location

It seems that nursing homes in urban areas provide a better quality of care than those in rural areas because the former compete more with each other to meet the needs of residents. Such competition may facilitate a better quality of care. Thus, this study expects that urban nursing homes will provide a higher quality of care than those located in rural areas. In this study, location is measured as a dummy variable coded 1 if a nursing home is located within the boundary of a Metropolitan Statistical Area and 0 otherwise.

RESULTS AND ANALYSIS

Descriptive Statistics

Table 1 shows the means and standard deviations of all independent and dependent variables.

Table 1. Descriptive Statistics

Variables	Number of cases	Mean or ratio	Standard deviation
Pressure sores	12,726	7.34%	5.11
Feeding tubes	12,726	6.33%	7.79
Indwelling catheters	12,726	6.64%	6.00
Ratio of NA hours to total nursing hours	12,740	0.64	0.08

Variables	Number of cases	Mean or ratio	Standard deviation
Ownership type	12,740	–	–
Nonprofits	3,253	25.53%	–
For-profits	8,900	69.86%	–
Public (government-owned)	587	4.61%	–
Number of certified beds	12,740	112.20	63.90
ADL Index	12,726	3.92	0.50
Medicaid recipients	12,740	65.30%	18.41
Comprehensive care plan deficiency	12,726	0.62	1.51
Physical restraints	12,740	7.82%	8.85
Number of rehabilitation beds	12,726	0.90	8.09
Market competition	12,740	0.22	0.25
Nonprofit market share	12,737	26.69%	24.45
Population over the age of 65	12,740	13.72%	3.82
Low-income population	12,738	12.82%	4.49
Location (urban vs. rural)	12,726	–	–
Urban	8,302	65.20%	–
Rural	4,424	34.80%	–

Results

Table 2 displays ordinary least squares regression results for potential determinants of nursing home quality. The empirical models show model fits ranging from 0.06 to 0.22 of the variance in nursing home quality measured by the proportion of residents having pressure sores or using a feeding tube or indwelling catheter. Most (but not all) independent variables have statistically significant influences on nursing home quality. The models show that the ratio of NA hours is the variable that has the strongest positive impact on service quality. As seen in table 2, most structural variables have significant relationships with service quality. Ratio of NA hours, number of certified beds, and average ADL scores have significant impacts on the quality of care in the predicted direction. But ownership type does not have a consistently significant influence on service quality, and the proportion of Medicaid recipients has a significant impact on nursing home quality but in mixed directions.

As expected, the ratio of NA hours per resident day has a positive effect on nursing home quality. As an example, the coefficient shows that a higher ratio of NA hours corresponds to a 17.67 percent decrease in residents using a feeding tube. This means

Table 2. Determinants of Nursing Home Quality: Ordinary Least Squares Regression

Independent variables	Dependent variables (standard errors)		
	Pressure sores	Feeding tubes	Indwelling catheters
Structural variables			
Ratio of NA hours to total nursing hours	-10.260*** (0.555)	-17.668*** (0.786)	-13.359*** (0.619)
Ownership type			
Nonprofit	-0.295** (0.121)	-0.017 (0.171)	0.069 (0.134)
Public	-0.327 (0.213)	0.212 (0.301)	0.699*** (0.237)
Number of certified beds	0.004*** (0.001)	0.002* (0.001)	-0.001 (0.001)
Average ADL score	1.469*** (0.088)	3.558*** (0.125)	1.269*** (0.099)
% of residents receiving Medicaid	-0.020*** (0.003)	0.084*** (0.004)	-0.012*** (0.003)
Process variables			
Comprehensive care plan deficiency	0.124*** (0.029)	0.024 (0.041)	0.114*** (0.032)
% of residents with physical restraints	0.028*** (0.005)	0.048*** (0.007)	0.020*** (0.006)
Number of specialized rehabilitation beds	0.001 (0.005)	0.000 (0.008)	0.009 (0.006)
Environmental variables			
Market competition (Herfindahl Index)	-0.328 (0.217)	-2.081*** (0.307)	-0.126 (0.242)
Nonprofit market share	-0.003 (0.002)	-0.012*** (0.003)	-0.008*** (0.002)
% of population over age 65	-0.065*** (0.013)	-0.171*** (0.015)	-0.050*** (0.014)
% of low-income population	0.150*** (0.010)	0.352*** (0.015)	0.068*** (0.012)
Location	0.688*** (0.126)	1.394*** (0.178)	0.018 (0.141)
R^2	0.089	0.216	0.060
Adjusted R^2	0.088	0.215	0.059
F	89.107***	249.929***	57.464***
Number of cases	12,740	12,740	12,740

Note: For-profit homes omitted under "ownership type."
*P ≤ 0.10; **P ≤ 0.05; ***P ≤ 0.01

that ratio of NA hours to total nursing hours is a critical factor influencing nursing home quality. Therefore, nursing homes need to operate training programs for NAs to provide residents with more skilled care services (Harrington & Kovner et al., 2000).

As predicted, the number of certified beds is negatively associated with nursing home quality, although it does not have a statistically significant relationship with quality of care measured by indwelling catheters.[3] It seems that the result may be associated with the excess demand of residents for nursing home services. Nursing homes try to increase the number of beds to respond to such demands from residents. But an increase in the number of certified beds that exceeds the home's ability to provide services may result in a low quality of care. A smaller size may allow for better managerial control and a higher quality of care (Zinn et al., 1993).

Nonprofit nursing homes have a more positive effect on service quality measured by pressure sores than for-profit and government-owned nursing homes. This result might stem from the fact that nonprofit nursing homes have better nursing staffs than for-profit and government-owned nursing homes (Aaronson et al., 1994; Cohen & Spector 1996; Harrington et al., 2001). In particular, pressure sores can be resolved by frequently repositioning immobile residents with continuous help by the nursing staff (Zhang & Grabowski, 2004). But this study does not find a difference between nonprofit and other nursing homes in nursing home quality measured by feeding tubes and catheters. The results may be interpreted as indicating that the effect of ownership type on nursing home quality varies depending on the quality measure, if the quality is particularly measured by the proportion of diseases that patients have.

On the other hand, this study does not find that there is a difference in quality of care between public and non-public (for-profit and nonprofit) nursing homes. In fact, public nursing homes owned by local governments account for only 5 percent of total nursing homes in the United States. Most of them have smaller nursing staffs, nursing facilities, and financial supports than their for-profit and nonprofit counterparts. It is unreasonable to expect high nursing home quality under these unfavorable conditions.

An interesting finding is that the proportion of Medicaid recipients showed mixed influence on nursing home quality. While it has a positive effect on the quality of care as evidenced by a lower rate of residents having pressure sores and using a catheter, it is negatively associated with quality as evidenced by a higher rate of residents using a feeding tube. The reason that the proportion of Medicaid recipients is positively

3. As mentioned earlier, the number of certified beds could have a negative effect, with the provision of additional beds reaching a point at which nursing staff and financial resources cannot cover patients' care. Thus, I examined scatterplots of the number of certified beds and nursing home quality. I did not find a nonlinear relationship between the two variables.

associated with quality of care measured by pressure sores and use of catheters is that these conditions require less intensive skilled care services. Therefore, continuous care for Medicaid recipients can reduce the rate of residents having pressure sores or using catheters. But feeding tubes need professional skilled care and are difficult to handle in a short period of time (Harrington & Kovner et al., 2000). For this reason, it seems that the proportion of Medicaid recipients is negatively associated with feeding tubes.

Process factor variables have significantly negative relationships with nursing home quality, except for the number of specialized rehabilitation beds. More severe comprehensive care plan deficiencies are associated with poorer quality of care. For example, a one unit increase in the severity of the comprehensive care plan deficiencies increases the percentage of residents having pressure sores by 0.12 percent. This implies that a poor care in health care processes is negatively associated with quality of nursing care. As expected, a higher proportion of residents with physical restraints is associated with a lower quality of care. The negative effect of physical restraints on service quality means that immobility resulting from the use of physical restraints increases the risk of pressure sores and need for a feeding tube or catheter. Thus, a higher proportion of residents with physical restraints has potentially negative consequences for residents' health (Zinn, 1994).

Most environmental variables are significantly associated with nursing home quality. As expected, while nonprofit market share and the proportion of the population over the age of 65 have positive influences on quality of care, the proportion of low-income population is negatively associated with nursing home quality. Contrary to my expectation, market competition and urban vs. rural location have negative impacts on the quality of care, although these variables do not show consistent statistical significance in all three quality measures.

A higher increase in nonprofit market share is positively associated with a higher quality of care. For example, the coefficient shows that a 1 percent increase in nonprofit market share reduces the percentage of residents using a feeding tube by 0.01 percent. This result supports previous empirical findings that a higher increase in nonprofit market share leads to higher quality overall in for-profit and nonprofit nursing homes through a spillover effect (Grabowski & Castle, 2004; Grabowski & Hirth, 2003).

As expected, the proportion of the population over the age of 65 is positively associated with the quality of care. As one example, the coefficient shows that a 1 percent increase in this variable reduces the percentage of residents using a feeding tube by 0.17 percent. This result may be interpreted as a result of continuous responses to the demands of the elderly as a major target group of nursing homes. The proportion of low-income population has a consistent negative effect on the quality of care. It may be demonstrated that nursing homes located in poorer areas may be less motivated to

compete on the basis of quality to admit high-income residents, and this lack of competition results in a lower quality of care.

Contrary to my expectation, market competition (as measured by the Herfindahl Index) does not have a positive effect on nursing home quality. Rather, it is negatively associated with the quality of care measured by feeding tubes. This unexpected result might be interpreted as indicating that in a nursing home market in which market concentration does not accompany supplier power, market competition may not be effective in improving quality.

This study shows that nursing homes located in urban areas have a poorer quality of care than those located in rural areas. This unexpected result may be partly related to excess demand by patients. More nursing homes are located in urban areas than in rural areas and thus, the former is easier to face excess demand. There is a high possibility of a negative relationship between excess demand by patients and quality of care due to lack of beds and of skilled professional nursing staff. For this reason, nursing homes in urban areas may provide a poorer quality of care than those in rural areas. Another reason is that recently, many nursing homes in rural areas have tried to improve service quality through collaboration at the community level, and this may lead to higher quality.

DISCUSSION AND CONCLUSIONS

The objective of this study was to examine the determinants of nursing home quality, providing a theoretical framework including structural, process, and environmental factors. The study shows that most but not all independent variables have statistically significant relationships to nursing home quality. In particular, it is meaningful that process and environmental factors have a significant influence on nursing home quality. Staffing levels measured by the ratio of NA hours to total nursing hours is the variable with the strongest positive influence on the quality of care. Market competition does not have a positive effect on nursing home quality; this implies that competition may not be a good way to improve the quality of nursing home care.

This study does not show that nonprofit nursing homes consistently provide a higher quality of care than for-profit and government-owned nursing homes. Furthermore, a simple comparison between for-profits and nonprofits might be neither necessary nor sufficient to conclude that the latter is a better form of organizational ownership for improving nursing home quality than the former. For this reason, the substantial influence of nonprofits on nursing home quality may be examined by focusing on whether an increase in nonprofit market share has a positive effect on both for-profit

and overall nursing home quality or not. This study finds it does. This implies that a competitive spillover effect from nonprofits leads to higher quality by encouraging the improvement of both for-profit and overall nursing home quality.

Market competition's lack of impact on nursing home quality, an unexpected finding, may stem from the unique characteristics of health care services such as nursing homes. Health care services tend to have a lower chance of salutary competition among service providers because the cost of entry into the field is high, and continuity of care makes it difficult for new service providers to participate in health care market (Lipsky & Smith, 1992). Thus, competition in health care services may not help improve service quality. This may require a new institutional arrangement among for-profit, nonprofit, and government-owned nursing homes to improve the quality of care in a nursing home market.

Certain limitations of this study need to be taken into consideration. First, there is a possibility that the error term of ordinary least squares regression may include the pre-condition of patients. Accordingly, one needs to exercise some caution in interpreting coefficient estimates because the error term may be correlated with other explanatory variables via self-patients. Second, this study measured quality by the proportion of residents having pressure sores, using a feeding tube, and using a catheter in each nursing home. But these quality measures may not be comprehensive and perfect. Therefore, future studies need to develop more valid quality measures.

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