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RESEARCH ARTICLE

# Nurse Staffing and Deficiencies in the Largest For-Profit Nursing Home Chains and Chains Owned by Private Equity Companies

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**Objective.** To compare staffing levels and deficiencies of the 10 largest U.S. for-profit nursing home chains with five other ownership groups and chain staffing and deficiencies before and after purchase by four private equity (PE) companies.

**Data Sources.** Facilities for the largest for-profit chains were identified through Internet searches and company reports and matched with federal secondary data for 2003–2008 for each ownership group.

**Study Design.** Descriptive statistics and generalized estimation equation panel regression models examined staffing and deficiencies by ownership groups in the 2003–2008 period, controlling for facility characteristics, resident acuity, and market factors with state fixed effects.

**Principal Findings.** The top 10 for-profit chains had lower registered nurse and total nurse staffing hours than government facilities, controlling for other factors. The top 10 chains received 36 percent higher deficiencies and 41 percent higher serious deficiencies than government facilities. Other for-profit facilities also had lower staffing and higher deficiencies than government facilities. The chains purchased by PE companies showed little change in staffing levels, but the number of deficiencies and serious deficiencies increased in some postpurchase years compared with the prepurchase period.

**Conclusions.** There is a need for greater study of large for-profit chains as well as those chains purchased by PE companies.

**Key Words.** Ownership/governance (for-profit/NFP/public/chains/systems), long-term care: home care/nursing homes, quality of care/patient safety (measurement)

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Poor quality of care is an endemic problem in many U.S. nursing homes (US Government Accountability Office [US GAO] 1987, 2003, 2007, 2009a, b.

A number of studies have found that for-profit ownership is related to poorer quality of care than nonprofit ownership (Hillmer et al. 2005; Comondore et al. 2009). There is some evidence that nursing home chains, defined as companies that own or operate two or more facilities, also have lower staffing, poor resident outcomes, and more deficiencies (violations of regulations) (Cohen and Spector 1996; Grabowski 2001a, b; Harrington et al. 2001; Banaszak-Holl et al. 2002; O'Neill et al. 2003; Harrington, Mullan, and Carrillo 2004; Kim, Harrington, and Greene 2009a; Kim et al. 2009b). Recently, the US GAO (2009a) found that the most poorly performing nursing homes in the United States tended to be owned by for-profit chains.

Nursing home chains grew steady in numbers and emerged as a dominant organizational form in the 1990s (Banaszak-Holl et al. 2002). In 2008, chains made up 54 percent of the nation's 16,000 nursing homes (Harrington et al. 2010). A number of chains were public-traded companies until the early 2000s, when five of the nation's largest chains entered into bankruptcy (Stevenson, Grabowski, and Coots 2006; Harrington et al. 2011). After restructuring and ownership changes in the early 2000s and increases in Medicare payments, the largest nursing home chains became more financially stable (US GAO 2002). More recently, some of the largest publicly held chains were purchased by private equity (PE) investment firms, which invest funds received from private investors and share the profits and losses (Stevenson and Grabowski 2008; US GAO 2010).

No studies were found that specifically examined quality of care in the largest for-profit chains. The 10 largest nursing home chains were selected for this study because they have been the most successful nursing homes in terms of their growth and market share, having weathered financial strains to maintain their position at the top. The quality of care delivered by the 10 largest chains is important because they provide care to about 14 percent of the nation's residents (LaPorte 2009; Harrington et al. 2011). Moreover, their quality assurance, managerial, and financial strategies may be emulated by smaller chains and other nursing homes.

To address questions of quality in large for-profit chains, this study had two major aims. The first was to compare the quality of care in the 10 largest

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for-profit nursing home chains with five nursing home ownership groups: (1) other for-profit chains; (2) for-profit nonchains; (3) nonprofit chains; (4) nonprofit nonchains; and (5) government facilities. Four quality outcomes were selected for the analysis using federal data: (1) registered nurse staffing levels; (2) total nurse staffing levels; (3) the total number of federal deficiencies (violations of federal quality standards); and (4) the number of serious federal deficiencies (where harm or jeopardy to a resident occurred). Second, this article examined the quality outcomes of the four largest nursing home chains purchased by PE firms. This study tested the hypothesis that the top 10 for-profit chains will have poorer quality than other ownership groups and that the largest chains will have poorer quality after purchase by PE firms.

Staffing and deficiency data from the federal On-Line Survey Certification and Reporting System (OSCAR) were used to compare the ownership groups for the period of 2003–2008. Generalized estimation equations (GEE) panel regression models were used to distinguish the outcomes among the different ownership groups with state fixed effects. This article also used GEE regression models to examine the pre- and postpurchase periods by PE companies.

## CONCEPTUAL FRAMEWORK

The development of nursing home chains has been viewed by some as an effective means of delivering efficient services (controlling costs) by taking advantage of economies of scale, standardizing services, and allowing knowledge or technology transfers (Banaszak-Holl et al. 2002). Chen and Shea (2004), however, showed that chain-owned nursing homes do not have lower short-term operating costs than independent facilities, suggesting that cost efficiencies are not the major reason for the horizontal integration of nursing homes. Alexander and D'Aunno (1990, p. 68) argued that health care organizations have increased in size through mergers, consolidations, and vertical integration as a way to “buffer or manage environmental threats and protect their technical core from disturbances in that environment.”

The largest nursing home chains were developed over time primarily through acquisitions and mergers and were heavily debt-financed, which in turn led to bankruptcies among five of the largest chains in the 1999–2002 period (US GAO 2002; Stevenson, Grabowski, and Coots 2006; Harrington et al. 2011). The theory of chain growth as a way to manage environmental threats is consistent with Baum's (1999) findings that nursing home chain

affiliation lowered the likelihood of financial failure, although the chains were not immune to bankruptcies in the 2000s (Stevenson, Grabowski, and Coots 2006).

Publicly traded companies have registered securities for sale to the public generally through a stock exchange. These chains operate on the concept of “shareholder value,” to benefit investors (Davis and Stout 1992; Fligstein 2001). Fligstein (2001) pointed out that companies use a system of applying rewards and sanctions to managers, boards of directors, and financial institutions to encourage the maximization of profits, return on equity, and stock prices. If companies fail to maximize returns, they may experience falling share prices, hostile takeovers, reductions in executive earnings and stock, and a loss of executive positions (Davis and Stout 1992; Davis and Thompson 1994). Under this system, executives must prioritize shareholder value over other goals such as quality services and employee welfare (Fligstein 2001).

Although there have been no empirical studies of the quality of the 10 largest nursing home chains compared with smaller chains or other types of ownership groups, we speculate that the largest chains will have poorer quality for a number of reasons. First, because the largest chains are heavily debt-financed with pressures by shareholders and investors for short-term profitability, they may make managerial decisions to prioritize financial goals at the expense of quality of care (Kitchener et al. 2008). These chains are probably better able to control their financial costs and staffing levels because of their managerial expertise, experience, administrative resources, and information systems than other types of owners (Banaszak-Holl et al. 2002). Second, large chains may be less concerned about competing on the basis of quality because they have the ability and resources to conduct active marketing campaigns to attract residents regardless of their quality (Kitchener et al. 2008; Harrington et al. 2011). In addition, to grow, large chains may purchase poorly performing facilities because they are less expensive to purchase than high facilities (Banaszak-Holl et al. 2002). Finally, large chains may have more resources (e.g., attorneys and funds) to fight against regulatory sanctions (i.e., deficiencies issued), so that regulatory sanctions for poor quality may have less impact on them than on other types of owners (Kitchener et al. 2008).

Nursing home chains have become attractive to PE investors since the 2000s, because chains often have large assets and can be profitable (US GAO 2002, 2009a, LaPorte 2009; MedPac 2009). PE investors may expect that they can be more efficient and profitable because they can exercise greater management control than publicly traded companies that have to respond to the

sometimes conflicting demands of many shareholders (Diamond 2008). Nursing home chains purchased by PE firms have been charged with having poorer quality of care than other nursing homes (Duhigg 2007). Only one published study examined the quality of nursing homes after purchase by PE companies, finding lower staffing levels, but not poorer quality after purchase, but the period after purchase was relatively short, and small and large chains were both included in the analysis (Stevenson and Grabowski 2008).

There are several potential reasons that chains owned by PE funds could have poor quality of care. PE firms have less expertise and experience in managing nursing homes than owners of chains that have specialized in nursing home services, although they could hire experienced chain managers (US GAO 2010). In addition, PE funds may eventually resell companies to other private owners or back to the public through initial public offerings, where resales can generate large profits for the fund managers and investors (Diamond 2008). A short-term goal of reselling a chain (rather than a long-term commitment) could result in a focus on cutting costs to improve financial results rather than investing in long-term facility improvement. Moreover, some PE companies may have their own problems in terms of stability and accountability, which could impede the quality of the services delivered (Diamond 2008). Finally, PE companies may be less subject to litigation, and so they may be less concerned about quality if they believe that their litigation risks are low.

### *Quality Outcome Measures*

Two types of quality measures that have been used in many other studies were selected for the study: nurse staffing levels and facility deficiencies.

*Nursing Staffing.* Some studies have found that poor nursing home quality is directly related to inadequate staffing levels (Harrington et al. 2000; US Centers for Medicare and Medicaid Services [CMS] 2001; Schnelle et al. 2004; Kim, Harrington, and Greene 2009a; Kim et al. 2009b). Nurse staffing levels have been documented to have a positive impact on both the process and the outcomes of nursing home care, such as fewer pressure ulcers, improved functional status, better mortality rates, and fewer deficiencies for poor quality (Cohen and Spector 1996; Harrington et al. 2000; Grabowski 2001a, b; US CMS 2001; Schnelle et al. 2004; Zhang and Grabowski 2004; Castle and Engberg 2007, 2008; Castle 2008). A systemic review of 87 research articles

and reports from 1975 to 2003 found that high total staffing levels, especially licensed staff, were associated with higher quality of care (Bostick et al. 2006). We elected to use registered nurse (RN) and total staffing hours based on these studies and because these measures are used by CMS to rate quality on the Medicare nursing home compare website.

*Deficiencies.* Using federal nursing home standards, states agencies conducted surveys to certify that nursing homes meet the federal standards for Medicare and Medicaid participation (US GAO 2003; Harrington, Mullan, and Carrillo 2004). Deficiencies are issued to facilities that fail to meet the requirements and are classified on the basis of their scope and severity (Level G or higher are called serious deficiencies because they are identified as those that caused harm or jeopardy to residents) (Grabowski and Stevenson 2008). The number of deficiencies and the most severe deficiencies were used as quality measures, which are used by CMS for rating facilities for Medicare nursing home comparison.

*Control Variables.* Three types of control variables were considered to impact on quality outcomes: facility characteristics, resident acuity, and market factors. Larger facilities have had been found to have lower staffing and more deficiencies, whereas hospital-based facilities generally have higher staffing and fewer deficiencies (Harrington, Mullan, and Carrillo 2004). Facilities with a greater proportion of Medicaid funding often have poor quality of care, because Medicaid rates are generally lower than private pay and Medicare rates (Mor et al. 2004). Facilities with high occupancy rates may have fewer deficiencies because these facilities may be in greater demand by consumers and may have more financial stability (Harrington, Mullan, and Carrillo 2004).

Resident acuity (i.e., case mix levels) needs to be controlled because it may confound the relationship between staffing and outcomes (Feng et al. 2008; MedPac 2009; OIG 2010). Residents' limitations in activities of daily living (ADLs) result in higher care needs and can require higher staffing levels (Harrington, Swan, and Carrillo 2007; OIG 2010). The percent of residents needing rehabilitation services represents the short-term Medicare residents who have higher nursing care and therapy needs (MedPac 2009).

Variations in market competition have been found to impact on staffing levels (Cohen and Spector 1996; Grabowski 2001a, b; Harrington, Swan, and

Carrillo 2007; Feng et al. 2008). In theory, facilities located in counties with greater competition may hire more nurses to compete on quality, and so they should have better quality of care and fewer deficiencies. Finally, variations in staffing levels and deficiencies may occur by year and across states because of time trends and policy differences.

## METHODS

The study compared all nursing homes (17,316 facilities) in the United States by ownership group during the 2003–2008 period (86,618 records for staffing data and 87,054 records deficiency data). (We excluded some facilities that had outliers on the staffing data and 35 facilities from the U.S. territories.) We used data from LaPorte (2008, 2009) and OSCAR data to identify the 10 largest for-profit chains (based on the number of beds) in 2008. (See Appendix AS2). Ownership refers to facilities either owned or operated by chains because they are not separately identified by the chains themselves or in OSCAR data.

### *Data Collection*

Data for the 10 largest chains were collected from company websites and documents to identify each facility in the chain in 2008. A total of 1,977 facilities were owned by the top 10 chains. Of these facilities, 996 were purchased by four PE companies in the 2003–2007 period: (1) HCR Manor care in 2007; (2) Genesis in 2007; (3) Golden Living in 2006; and (4) SavaSeniorCare LLC in 2004 (Stevenson and Grabowski 2008; Harrington et al. 2011). The facility name obtained from each chain was matched with the federal OSCAR provider file maintained by CMS for the 2003–2008 period. The data for the top 10 chains represented all facilities either owned by the chain or purchased by the chain during the 2003–2008 period. Facilities owned by the top 10 chains before 2008 were not included as part of the top 10 chains.

We compared the OSCAR provider number, licensee, owner name, a change in ownership, and the ownership change year of the facilities in the top 10 chains during 2003–2007 with the facilities owned by the chains in 2008. New facilities purchased by chains not owned by PE firms were less than 3 percent during the 2003–2007 period according to the OSCAR file. Although the OSCAR ownership change indicator identified less than half of the facilities purchased by PE companies, the OSCAR ownership name

showed that facilities generally remained within each chain before and after purchase. We concluded that facility ownership data within each chain for the 2003–2007 period were sufficiently accurate to conduct a panel analysis. As a test of this assumption, we conducted a separate panel analysis using a dummy variable for OSCAR ownership changes in the 2003–2008 period and found no difference from the analysis presented in the article.

OSCAR data were used to identify and classify all other nursing facilities into five ownership groups for the 2003–2008 period using the variable for chain ownership (yes or no) and ownership type (for-profit, nonprofit, or government). These data are generally considered fairly reliable and have been used in many other studies (Grabowski and Stevenson 2008; Stevenson and Grabowski 2008). OSCAR data were also used for all the independent variables in the study.

For staffing measures, all productive (nonvacation or sick leave) RN hours (including the director of nursing) and total nurse hours (RNs, licensed vocational nurses/licensed practical nurses [LVN/LPNs], and nursing assistants [NAs]) were included for full-time, part-time, and temporary employees. The RN and total hours per resident day (hprd) were divided by the number of residents in the facility to calculate the hours per resident per day. For the staffing analysis, there were 104 records (or 86 facilities) with zero RN hours or total nursing hours that were less than 0.5 hprd, and so those were dropped from the analysis.

The number of total deficiencies was the sum of all federal deficiencies, excluding life safety violations that pertain to physical plant requirements. These data also included all deficiencies from annual surveys as well as complaint surveys. Serious deficiencies were the number of level G or higher federal deficiencies. The percent of residents paid by Medicaid were the longer term residents. Acuity (case mix) was measured by resident limitations in three ADL scores (eating, toileting, and transferring), rated from 1 (for no assistance needed) to 3 (for complete assistance needed), which were added and then the averaged for each facility. The percent of residents that received rehabilitation represented the short-term Medicare rehabilitation residents.

The Herfindahl–Hirschman index was constructed using the total number of nursing facility beds divided by the total beds in each county, and then the proportions for each facility were squared and summed to create an index ranging from 0 to 1 with the highest values representing greater concentration (less competition). Excess beds were calculated by subtracting the number of



nursing home residents in the county from the total number of nursing home beds in the county.

### *Analysis*

We used descriptive statistics to describe the top 10 chains on staffing and deficiencies over the 2003–2008 period. Descriptive statistics were calculated for all variables using Stata version 10.0 (StataCorp.L.P., College Station, TX, USA) for each ownership group. Pearson correlations among the predictor variables were not high, showing that multicollinearity was not a likely problem.

Panel regression analyses were conducted using XTGEE generalized-effects estimator with robust standard errors to adjust for clustering at the facility level using Stata version 10.0 to examine RN and total nurse staffing hours per resident per day for the 2003–2008 period. Dummy variables were constructed for each ownership group, using government facilities as the comparison. Facility-level fixed effects models could not be used because ownership did not vary by year. The XTGEE was a reasonable approach to use, because it only involves assumptions of a marginal distribution. When the XTREG random-effects estimator panel analysis, which has somewhat stronger assumptions about the underlying parameter distribution than XTGEE, was compared, we found that the results were similar to the XTGEE analysis. The average number of years of panel data for facilities was five, because not all facilities are surveyed each year. All the models were controlled for facility characteristics, resident acuity, market factors, with state fixed effects (using dummy variables for states) and a dummy variable for each year.

For the deficiency analysis, we used the XTGEE panel analysis with negative binominal models for count data. As the serious deficiencies were less frequent than total deficiencies, we compared a logistic model for any serious deficiency with the number of serious deficiencies using the XTGEE negative binominal model. The models were similar, and so we chose to use the XTGEE analysis instead of the logit model.

We conducted separate XTGEE panel analyses on the chains purchased by PE firms, comparing the nurse staffing levels and deficiencies prior to and after the purchase from 2003 to 2008. The sample was limited to the top 10 chains (1,977 facilities) rather than the entire 17,316 facilities, because there were so few facilities purchased by the PE firms. The analysis included time dummies to control for the underlying secular trend, a dummy to control

for baseline differences for those that were purchased compared with those that were not, and an interaction term between the conversion dummy and the time period. As a result of collinearity, we excluded the 2005 interaction term and used interactions for 2006, 2007, and 2008, and dummy variables for states. We used the years for interactions rather than time from the sale because of the gap between the first sale in 2004 and the next sales in 2006 and 2007.

## FINDINGS

### *Descriptive Statistics*

Table 1 shows that RN hours (0.56 hprd) were lower in the top 10 chains compared with nonprofit chains (0.85 hprd), nonprofit nonchains (0.89 hprd), and government facilities (0.81 hprd), but higher than other for-profit chains and for-profit nonchains from 2003 to 2008. Total nursing hours were lower (3.39 hprd) in the top 10 nursing home chains than all other ownership groups (4.28 hprd for nonprofit nonchains and government facilities), even though these chains had significantly higher acuity (i.e., limitations in ADLs and percent of residents receiving rehabilitation) than all other ownership groups. The average number of total deficiencies (9.5 deficiencies) and serious deficiencies (0.7) were significantly higher in the top 10 nursing home chains than any other ownership group.

### *Staffing Regression Models*

Table 2 shows that the top 10 for-profit chains had 0.18 lower RN hprd and 0.86 lower total nursing hprd than government-owned facilities, controlling for facility characteristics, resident acuity, market factors, state variations, and year. Other for-profit chains and for-profit nonchains also had lower RN and total staffing than government facilities. Nonprofit chains also had lower total nurse staffing hours than government facilities. Facilities with a larger number of beds, higher occupancy rates and higher percentages of Medicaid residents, higher concentrations of beds within a county, and greater excess beds within a county were associated with lower RN and total nursing hours (Table 2). Hospital-based facilities and higher percentages of residents receiving rehabilitation services were associated with higher RN and total nursing hours. Higher percentages of residents with limitations in ADLs were associated with increases in total nursing hours, but lower RN hours. Compared

Table 1: Means and Standard Deviations (in Parentheses) for Nursing Homes by Ownership, 2003–2008

	Type of Ownership Group					Chains Purchased by Private Equity Firms					
	Top 10 For-Profit Chain Facilities	Other For-Profit Chain Facilities	For-Profit Nonchain Facilities	Nonprofit Chain Facilities	Nonprofit Nonchain Facilities	Government Facilities	Total Facilities	Genesis Health Care	Golden Living	HCR Manor Care	Sava Senior Care
N	1,977 (11.4%)	5,234 (30.2%)	4,368 (25.2%)	1,918 (11.1%)	2,773 (16.0%)	1,046 (6.0%)	17,316	203 (1.2%)	325 (1.9%)	283 (1.6%)	185 (1.1%)
Staffing											
RN hours per resident day	0.56 (0.25)	0.54*** (0.44)	0.52*** (0.36)	0.85*** (0.83)	0.89*** (0.84)	0.81*** (0.73)	0.64 (0.58)	0.65 (0.24)	0.51 (0.20)	0.56 (0.28)	0.48 (0.23)
Total hours per resident day	3.39 (0.69)	3.57*** (0.97)	3.59*** (0.96)	4.04*** (1.32)	4.28*** (1.32)	4.28*** (1.34)	3.75 (1.11)	3.56 (0.60)	3.15 (0.51)	3.53 (0.79)	3.17 (0.55)
Deficiencies											
Number of deficiencies	9.50 (8.02)	9.26* (8.36)	8.77*** (8.06)	6.85*** (6.49)	5.98*** (6.06)	6.78*** (6.39)	8.26 (7.74)	8.92 (8.03)	7.62 (7.20)	9.70 (7.54)	10.32 (8.30)
Number of deficiencies causing harm or jeopardy	0.70 (1.46)	0.66* (1.53)	0.56*** (1.41)	0.44*** (1.12)	0.38*** (0.99)	0.46*** (1.18)	0.56 (1.36)	0.51 (1.18)	0.47 (1.11)	0.61 (1.22)	0.83 (1.62)
Facility characteristics											
Number of facility beds	119.85 (43.85)	106.12*** (49.47)	112.09*** (63.10)	99.07*** (65.40)	103.06*** (81.67)	119.10 (126.80)	108.81 (66.60)	125.23 (46.73)	101.71 (39.87)	133.93 (38.24)	122.04 (37.01)
% Occupancy rate	87.41 (11.11)	82.46*** (14.98)	84.21*** (14.28)	86.56*** (13.54)	88.48*** (12.90)	84.76*** (14.89)	85.02 (14.08)	91.65 (6.47)	87.49 (11.21)	86.77 (10.69)	84.24 (11.71)
Hospital-based (1=yes)	0	0.02*** (0.15)	0.01*** (0.11)	0.15*** (0.36)	0.21*** (0.41)	0.33*** (0.47)	0.08 (0.27)	0	0	0	0

continued

Table 1. Continued

	Type of Ownership Group					Chains Purchased by Private Equity Firms					
	Top 10 For-Profit Chain Facilities	Other For-Profit Chain Facilities	For-Profit Nonchain Facilities	Nonprofit Chain Facilities	Nonprofit Nonchain Facilities	Government Facilities	Total Facilities	Genesis Health Care	Golden Living	HCR Manor Care	Sava Senior Care
% Medicaid residents	61.34 (17.36)	65.41*** (20.43)	67.99*** (20.37)	50.97*** (26.58)	51.70*** (27.34)	63.62*** (24.76)	61.74 (23.20)	65.79 (12.24)	67.59 (14.22)	48.53 (19.00)	66.39 (14.64)
Resident acuity	5.85 (0.55)	5.84* (0.66)	5.79*** (0.71)	5.77*** (0.62)	5.76*** (0.68)	5.77*** (0.71)	5.80 (0.66)	5.94 (0.44)	5.71 (0.57)	5.98 (0.45)	5.84 (0.54)
Limitations in daily living	26.93 (13.19)	20.94*** (15.42)	17.11*** (14.12)	23.49*** (23.54)	22.48*** (23.99)	16.39*** (20.85)	21.00 (18.13)	25.02 (10.26)	23.61 (11.04)	35.68 (14.87)	22.43 (10.86)
% Residents receiving rehabilitation											
Market factors											
Herfindahl (concentration)	0.20 (0.23)	0.22*** (0.24)	0.19*** (0.23)	0.23*** (0.25)	0.21*** (0.24)	0.40*** (0.32)	0.22 (0.25)	0.16 (0.20)	0.25 (0.24)	0.10 (0.11)	0.20 (0.22)
Excess beds in county	13.26 (7.54)	16.74*** (9.78)	15.94*** (9.58)	13.53* (8.11)	12.75*** (7.82)	15.08*** (10.55)	15.05 (9.20)	9.45 (4.07)	12.86 (8.49)	13.01 (5.72)	16.24 (8.28)

Note. *T*-tests for significance comparing the top 10 chains with each ownership group separately.

\*\*\*  $p < .001$ ,

\*\*  $p < .01$ ,

\*  $p < .05$  significance levels.

with 2003, there was a decline in RN hprd and an increase in total nursing hours each year.

### *Deficiency Regression Models*

Table 2 shows that deficiencies were 36 percent higher and serious deficiencies were 41 percent higher for the top 10 for-profit chains than for government facilities. Other for-profit chains and for-profit nonchains also had higher deficiencies and serious deficiencies than government facilities. Non-profit chains had more deficiencies than government facilities, but there was no difference in nonprofit nonchain facilities and government facilities. Facility size and the percent Medicaid residents were positively associated with total deficiencies and serious deficiencies. Facility occupancy rates, hospital-based facilities, and market areas with greater concentration were negatively associated with total deficiencies and serious deficiencies. The percent of residents with limitations in ADLs was positively associated with total deficiencies and serious deficiencies. Compared with 2003, total deficiencies declined in 2004, 2005, and 2008 (but increased in 2007), whereas serious deficiencies declined in 2004 and 2008.

### *Private Equity Company Regression Models*

Table 3 shows the XTGEE panel regression models for each of the four dependent variables with dummy variables for the companies after they were purchased by PE companies and interaction terms by year. RN hours decreased slightly in 2006 and increased slightly in 2008. For total nursing hours, there was no overall change except for a slight decrease in hours in 2007. The total number of deficiencies increased in the 2006, 2007, and 2008 periods after purchase by PE firms. Finally, the total number of severe deficiencies increased in 2006 and 2007, but not in 2008.

## DISCUSSION

The descriptive statistics from this study showed that total nurse staffing and deficiencies in the top 10 for-profit chains were worse than other ownership groups, whereas the top 10 chains had higher resident acuity. Even with higher acuity, the top chains were well below the national average for RN and total nurse staffing, and they were well below the minimum RN staffing

Table 2: Generalized Estimation Equation Panel Regression Analyses for Nursing Homes by Ownership, 2003–2008

	<i>RN Hours Per Resident Day</i>	<i>Total Nurse Hours Per Resident Day</i>	<i>Number of Deficiencies</i>	<i>Number of Deficiencies Causing Harm or Jeopardy</i>
<b>Ownership type</b>				
Top 10 for-profit chains	−0.177*** (0.018)	−0.863 *** (0.032)	0.311 *** (0.023)	0.344 *** (0.055)
Other for-profit chain facilities	−0.143*** (0.018)	−0.650 *** (0.032)	0.287 *** (0.021)	0.331 *** (0.052)
For-profit nonchain facilities	−0.128*** (0.018)	−0.525 *** (0.032)	0.227 *** (0.022)	0.211 *** (0.053)
Nonprofit chain facilities	0.025 (0.021)	−0.291*** (0.035)	0.078 *** (0.023)	0.111 (0.058)
Nonprofit nonchain facilities	0.031 (0.020)	−0.053 (0.034)	−0.016 (0.022)	−0.006 (0.054)
<b>Facility characteristics</b>				
Number of facility beds	−0.001*** (0.000)	−0.002 *** (0.000)	0.002 *** (0.000)	0.003 *** (0.000)
% Occupancy rate	−0.010 *** (0.000)	−0.023 *** (0.001)	−0.002 *** (0.000)	−0.006 *** (0.001)
Hospital-based (1=yes)	0.650 *** (0.022)	0.822 *** (0.033)	−0.095 *** (0.018)	−0.271 *** (0.051)
% Medicaid residents	−0.004 *** (0.000)	−0.007 *** (0.000)	0.005 *** (0.000)	0.008 *** (0.001)
<b>Resident acuity</b>				
% Residents with limitations in activities of daily living	−0.012** (0.004)	0.118 *** (0.009)	0.027 *** (0.006)	0.037* (0.015)
% Residents receiving rehabilitation	0.006 *** (0.000)	0.009 *** (0.000)	−0.000 (0.000)	−0.000 (0.001)
<b>Market factors</b>				
Herfindahl (concentration)	−0.153 *** (0.011)	−0.265 *** (0.023)	−0.097 *** (0.021)	−0.165*** (0.049)
Excess beds in county	−0.004 *** (0.000)	−0.006 *** (0.001)	0.000 (0.001)	−0.002 (0.002)
<b>Year</b>				
2004	−0.013*** (0.003)	0.017 ** (0.007)	−0.167 *** (0.009)	−0.189 *** (0.027)
2005	−0.023 *** (0.003)	0.024 ** (0.007)	−0.076 *** (0.010)	−0.030 (0.026)
2006	−0.028*** (0.003)	0.025 ** (0.008)	0.013 (0.009)	0.011 (0.027)

*continued*

Table 2. *Continued*

	<i>RN Hours Per Resident Day</i>	<i>Total Nurse Hours Per Resident Day</i>	<i>Number of Deficiencies</i>	<i>Number of Deficiencies Causing Harm or Jeopardy</i>
2007	-0.032*** (0.003)	0.058 *** (0.008)	0.047 *** (0.009)	-0.023 (0.028)
2008	-0.033 *** (0.003)	0.094 *** (0.008)	-0.062 *** (0.010)	-0.124 *** (0.029)
Intercept	1.977 *** (0.051)	6.242 *** (0.089)	1.794 *** (0.059)	-1.993 *** (0.148)
Number of records	86,618	86,618	87,054	87,054
Chi-square and <i>p</i> -values	7,975 ***	13,786 ***	9,045 ***	4,208 ***

*Notes.* Ownership comparison is government facilities. XTGEE panel regressions with robust standard errors (clustering on facility identifier). State dummy variables used as control variables. 2003 was the comparison year.

\*\*\**p* < .001,

\*\**p* < .01,

\**p* < .05 significance levels.

and total nurse staffing recommended by experts (US CMS 2001; Institute of Medicine 2003; Schnelle et al. 2004). This study's finding of the highest acuity in the top 10 for-profit chains was consistent with a new study that found high reported acuity by for-profit chains, even though actual resident characteristics were similar to other types of facilities (OIG 2010).

The regression models showed that RN staffing and total nurse staffing levels were lower in the top 10 for-profit chains than in government facilities, whereas other for-profit chains and nonchains also had lower staffing than government facilities. Lower staffing levels, especially RN staffing, translate into lower labor costs, which appears to be a management strategy by the top 10 chains as well as other for-profit facilities to reduce costs. The low staffing levels are a major concern because low staffing, especially RN staffing, have been associated with more federal deficiencies and poorer resident outcomes as noted in previous studies (Cohen and Spector 1996; Harrington et al. 2000; Grabowski 2001a, b; US CMS 2001; Schnelle et al. 2004; Zhang and Grabowski 2004; Bostick et al. 2006; Castle and Engberg 2007, 2008; Castle 2008; Kim, Harrington, and Greene 2009a; Kim et al. 2009b). Moreover, facility staffing from OSCAR data is probably over-reported (US CMS 2001; Kash, Hawes, and Phillips 2007). The new Affordable Care Act (ACA)

Table 3: Generalized Estimation Equation Panel Regression Analyses for the Four Nursing Homes Purchased by Private Equity Companies and the Six Other Largest Nursing Home Chains, 2003–2008

	<i>RN Hours Per Resident Day</i>	<i>Total Nurse Hours Per Resident Day</i>	<i>Number of Deficiencies</i>	<i>Number of Deficiencies Causing Harm or Jeopardy</i>
Ownership type				
Postsale	−0.011 (0.014)	−0.009 (0.038)	−0.158 ** (0.067)	−0.297** (0.137)
Postsale interaction with 2006	−0.018* (0.009)	−0.063 (0.042)	0.197** (0.083)	0.450** (0.192)
Postsale interaction with 2007	−0.019 (0.014)	−0.111** (0.044)	0.205*** (0.075)	0.393** (0.173)
Postsale interaction with 2008	0.033** (0.016)	0.006 (0.045)	0.129* (0.075)	0.080 (0.172)
Facility characteristics				
Number of facility beds	−0.001 **** (0.000)	−0.000 (0.000)	0.004 **** (0.000)	0.005 **** (0.001)
% Occupancy rate	−0.005 **** (0.000)	−0.017 **** (0.001)	−0.001 (0.001)	−0.004 ** (0.002)
% Medicaid residents	−0.002 **** (0.000)	−0.005**** (0.001)	0.003 **** (0.001)	0.007**** (0.002)
Resident acuity				
% Residents with limitations in activities of daily living	0.006 (0.005)	0.055 *** (0.020)	0.047 *** (0.017)	0.044 (0.042)
% Residents receiving rehabilitation	0.001 **** (0.000)	0.004 **** (0.001)	0.002** (0.001)	0.004 (0.002)
Market factors				
Herfindahl (concentration)	−0.029* (0.015)	−0.182 **** (0.047)	−0.188 *** (0.061)	−0.289 ** (0.131)
Excess beds in county	−0.001 ** (0.001)	−0.005*** (0.002)	0.000 (0.002)	−0.001 (0.004)
2004	−0.007 (0.004)	−0.014 (0.015)	−0.201**** (0.025)	−0.269**** (0.063)
2005	−0.004 (0.005)	−0.002 (0.019)	−0.082*** (0.026)	−0.066 (0.063)
2006	0.001 (0.006)	0.026 (0.018)	−0.039 (0.026)	−0.071 (0.070)

continued



Table 3. *Continued*

	<i>RN Hours Per Resident Day</i>	<i>Total Nurse Hours Per Resident Day</i>	<i>Number of Deficiencies</i>	<i>Number of Deficiencies Causing Harm or Jeopardy</i>
2007	0.008 (0.007)	0.075**** (0.022)	0.010 (0.028)	-0.068 (0.075)
2008	0.009 (0.008)	0.096**** (0.026)	-0.064* (0.034)	-0.041 (0.093)
Intercept	1.156 **** (0.071)	4.994 **** (0.223)	1.745 **** (0.173)	-1.985**** (0.386)
Number of records	10,830	10,830	10,880	10,880
Chi-square ( <i>p</i> -value in parentheses)	1,712 ****	1,778 ****	1,532 ****	858 ****

*Notes.* Postsale to private equity company coded 1 and compared with the presale period. XTGEE panel regressions with robust standard errors (clustering on facility identifier). Hospital-based facilities excluded because they were not owned by private equity companies.

\*\*\*\**p* < .001,

\*\*\**p* < .01,

\*\**p* < .05,

\**p* < .10 significance levels.

(Public Law 111-148) of 2010 requires CMS to collect and report quarterly electronic payroll staffing data from facilities, which should greatly improve the quality of the staffing data. CMS should be able to use such data to identify facilities and chains with low staffing levels and to target such facilities for monitoring.

This study found that RN staffing was lower and total staffing levels were higher in the 2004–2008 period compared with 2003, suggesting a trend of substituting lower paid nursing staff for RNs. This is consistent with previous findings of a substantial decline in RN staffing and increases in deficiencies after the adoption of the Medicare prospective payment system in 1998, which gave nursing homes a direct incentive to reduce RNs and shift to lower cost staff (Konetzka et al. 2004). The findings of low staffing levels in the top 10 for-profit chains and other for-profit companies and poor quality suggests that staffing has not been adequately addressed by current public policies, in spite of many recommendations to increase nurse staffing standards (US CMS 2001; Institute of Medicine 2003; Schnelle et al. 2004).

The regressions showed that the top 10 for-profit chains had significantly higher numbers of deficiencies (36 percent) and serious deficiencies

(41 percent) than government facilities, consistent with the findings of lower staffing levels. Other for-profit homes also had higher total deficiencies and serious deficiencies. The findings are consistent with previous studies on the quality problems in chains and for-profit facilities (Harrington et al. 2001; Banaszak-Holl et al. 2002; O'Neill et al. 2003; Harrington, Mullan, and Carrillo 2004; Kim, Harrington, and Greene 2009a; Kim et al. 2009b). The high deficiencies in the top 10 for-profit chains are a concern because many studies have documented that the federal regulatory system is weak and poor quality is often underidentified and underreported (US GAO 1987, 2003, 2007, 2009a, b).

For the chains purchased by PE companies, the total number of deficiencies increased in the 2006, 2007, and 2008 periods after purchase by PE firms, and the total number of severe deficiencies increased in 2006 and 2007, but not in 2008. This finding is not surprising because these chains already had lower RN and total staffing levels than nonprofit and government homes before purchase by PE firms. Moreover, there was little change in staffing after PE purchase (RN hours increased slightly in 2008 and total staffing decreased slightly in 2007). Perhaps changes in leadership, management, and employees after the purchase could have resulted in poorer quality of care, because as noted previously, these companies may have less management expertise than owners who specialize in nursing homes. PE companies may also be less concerned about quality if they believe their litigation risks are low. On the other hand, regulators may be giving PE companies greater scrutiny because of quality concerns, which in turn could result in the issuing of more deficiencies than for other facilities. The short postperiod for the purchase by PE firms, however, was a limitation of the study, and so additional follow-up is needed to determine if their quality changes in the future.

The ACA of 2010 included nursing home transparency provisions requiring CMS to collect new ownership data, which the GAO concludes is strongly needed (US GAO 2010). The law should allow CMS to greatly improve its tracking and regulatory monitoring of chains and eventually will allow researchers access to more accurate ownership data. Currently, chains with facilities in many states are difficult to monitor, especially because state agencies focus on individual facilities within states and lack access to accurate data about chain ownership within and across states (US GAO 2010). CMS should develop a greater focus on monitoring staffing and deficiencies in for-profit chains to identify problems within and across states.

This study has several limitations. One important limitation is not being able to completely identify all the historic changes in chain ownership,

although we captured facilities purchased during the period. The resident acuity measures used in the study were crude indicators and may not fully identify acuity differences; if there are unmeasured differences in case mix acuity across the different types of facilities that are also correlated with the outcomes studied, then the estimates of the effects of chain ownership could be biased. This is especially important in that changes in the average acuity over the time period were documented, so that differential changes by type of facility could bias results. There may also be other omitted time-varying factors (e.g., changes in state policy or increased scrutiny by regulators once a facility is acquired by a PE company) or reverse causality issues that present additional biases (e.g., chains and PE companies may acquire facilities that are failing, so that they tend to look worse due to preexisting trends). Finally, the nurse staffing analysis did not take into account the therapy staff members who provide rehabilitation services nor the quality or efficiency of any type of staff. Thus, the results cannot be interpreted as causal, but they are suggestive that the largest for-profit chains deliver poorer quality of care than other types of nursing homes.

In conclusion, this is the first study to focus on the staffing and quality in the top 10 for-profit chains. The results show evidence of the relationship between their ownership and low staffing and higher deficiencies. The trends, however, may have existed before purchase by the large chains, and the acquiring entities may need more time to address the quality problems. The study does provide evidence of the need for more study of quality of care in the largest for-profit chains and in chains purchased by PE firms, because they are under pressure to improve shareholder and investor values, with little oversight by regulators.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Description of the Top 10 For-Profit Nursing Home Companies in the United States in 2008.

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