

The Association of Nursing Home Compare Quality Measures with Market Competition and Occupancy Rates

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Abstract: Since 2002, the Centers for Medicare and Medicaid Services have reported quality measures on the Nursing Home Compare Web site. It has been assumed that nursing homes are able to make improvements on these measures. In this study researchers examined nursing homes to see whether they have improved their quality scores, after accounting for regression to the mean. Researchers also examined whether gains varied according to market competition or market occupancy rates. They identified some regression to the mean for the quality measure scores over time; nevertheless, they also determined that some nursing homes had indeed made small improvements in their quality measure scores. As would be predicted based on the market-driven mechanism underlying quality improvements using report cards, the greatest improvements occurred in the most competitive markets and in those with the lowest average occupancy rates. As policies to promote more competition in long-term care proceed, further reducing occupancy rates, further, albeit small, quality gains will likely be made in the future.

Key Words

competition
nursing homes
quality
report cards

The Web-based Nursing Home Compare report card reports information about quality (given in the form of quality measures) for every Medicare- or Medicaid-certified nursing home in the United States (General Accounting Office [GAO], 2002). In this study, researchers examined whether nursing homes have been able to improve their quality measures over time (after accounting for regression to the mean). They also examined whether changes in quality measures vary according to market competition or market occupancy rates.

In addition to the quality measures, the number of beds, types of ownership, and staffing levels are reported on Nursing Home Compare. By using this information, consumers have the potential to select a nursing home that best meets their preferences in these areas. However, Nursing Home Compare was

charged with more than just providing consumers with information. The Nursing Home Compare report card was touted as a means of promoting quality change in the nursing home industry (Mantone, 2005). As with all health-care report cards, the mechanism behind this change in the industry rests on the assumption that consumers will migrate toward higher-quality facilities and that nursing homes will compete to improve their quality in order to attract potential residents. This mechanism is generally referred to as the consumer-choice model (Hibbard, Slovic, & Jewett, 1997). In some cases, similar public reporting initiatives have been shown to be a powerful form of audit and feedback associated with changing provider behavior (Marshall, Shekelle, Leatherman, & Brook, 2000).

However, in the nursing home industry some markets experience limited competition among facilities. Many nursing homes experience excess demand, as demonstrated by very high occupancy rates and long waiting lists. Moreover, even changes in hospital market behavior (hospital markets are generally more competitive than nursing home markets) associated with the release of some report cards have been equivocal (Marshall et al., 2000). As Green and Wintfeld (1995) report, after the release of the hospital mortality report card by the Health Care Financing Administration (now called the Centers for Medicare and Medicaid Services [CMS]), few provider practices changed. These barriers and past experience with some other report cards do not necessarily mean that Nursing Home Compare will falter in improving nursing home quality, but this finding clearly casts some doubt on the potential that Nursing Home Compare can promote changes in this area.

Little information addressing the issue of whether nursing homes are making improvements in quality measures exists. CMS maintains that progress has been made in improving nursing home quality and has

reported that some quality measure scores have declined over time (GAO, 2002). In all cases, lower quality measure scores represent better quality. However, the details provided by CMS are incomplete. For example, it is not clear whether the results reported are representative of all nursing homes or whether the noted improvements are statistically significant. Using all the nursing homes included in Nursing Home Compare, Liu and Castle (2005) provided a descriptive account of whether the quality measures had changed during 1 year (January 2003–January 2004). They found that a slightly greater number of nursing homes had a decrease in their quality scores than an increase, indicating some overall improvement in quality (Liu & Castle). However, the overall changes in quality measures reported by these authors were small and averaged only about 1%. From 2002 through 2004, Zinn, Spector, Hsieh, and Mukamel (2005) examined facility characteristics associated with quality measure scores. They found that most quality measure scores improved, but these changes were not associated with facility characteristics (Zinn et al.). Castle, Engberg, and Liu (2007) examined whether market competition or occupancy rates influenced changes in the quality measure scores from January 2003 through January 2004. They found that in the 14 quality measures examined, high levels of competition were weakly associated with six improved scores, and lower occupancy rates were weakly associated with seven improved scores (Castle, Engberg, & Liu).

The results from these prior studies (Castle, Engberg, & Liu, 2007; GAO, 2002; Liu & Castle, 2005; Zinn et al., 2005), could be representative of a regression to the mean phenomenon, whereby the changes seen were random rather than systematic. That is, regression to the mean is a statistical phenomenon “that can make natural variation in repeated measures look like real change. It happens when unusually large or small measurements tend to be followed by measurements that are closer to the mean” (Barnett, van der Pols, & Dobson, 2005, p. 215), and attributing these changes to an intervention is called the *regression fallacy* (Morton & Torgerson, 2003). Thus, the first objective of this investigation was to examine whether changes in the Nursing Home Compare quality measures follow a pattern indicating regression to the mean.

The second objective was to determine whether competition or demand influenced the

quality measure scores reported on Nursing Home Compare during a 2-year period. We believe this is likely because in prior research, competition among nursing homes has been shown to be associated with quality of care, revenues, facility certification, and hospitalization of residents (Angeles, Mor, Intrator, Feng, & Zinn, 2003; Hughes, Lapane, & Mor, 2000; Intrator, Castle, & Mor, 1999; Weech-Maldonado, Neff, & Mor, 2003), and occupancy rates have been associated with quality and facility certification (Harrington & Swan, 2003; Kash, Castle, & Hawes, 2006; Mullan & Harrington, 2001). This pattern also follows the tenets of the consumer-choice model: nursing homes in markets with more competition or less demand will respond to Nursing Home Compare evaluations by significantly improving their quality. Castle, Engberg, and Liu (2007) examined these associations. Nevertheless, the results of this prior research were described as weak. The prior work was improved upon in the research described in this article, because a longer time period and more refined statistical methods, including controlling for regression to the mean, were used.

These issues have important policy implications. Little evidence that consumer empowerment policies influence provider quality exists. Understanding the impact of consumer empowerment and report cards is thus important for the Nursing Home Compare initiative. However, some generalizability may exist with consumer empowerment initiatives that are central to healthcare reform in countries outside of the United States, such as the United Kingdom (Donaldson & Ruta, 2005) and the Netherlands (Schut & Van de Ven, 2005). In addition, this investigation has implications for addressing whether report cards can influence providers, which is of cross-national significance (Marshall et al., 2000).

Data and Methods

Source of Data

Data used in this analysis came from the Nursing Home Compare Web site from January 2004 and January 2006 and were linked with the On-line Survey, Certification And Recording (OSCAR) data collected at baseline (2004). These data included information for the quality measures, 15 of which were reported at both collection times. Twelve quality measures were for long-stay residents and three for short-stay residents. The data in Nursing Home Compare

includes quality measures from all Medicare- or Medicaid-certified nursing homes ($N = 14,224$), although not every quality measure has a value for every nursing home.

The Minimum Data Set (MDS) is used to construct the Nursing Home Compare quality measures. The MDS is generally considered to be a reliable data source (Mor, 2005). However, nursing homes may improve in completing the MDS documentation (Mor). This can influence the quality measures by giving a false view that improvements have occurred and is a limitation of the analyses for which researchers cannot control.

The OSCAR is conducted by state licensure and certification agencies as part of the Medicare or Medicaid certification process and includes all of the nursing homes in Nursing Home Compare. The OSCAR data are widely used as a secondary source of nursing home characteristics (Bourbonniere et al., 2006; Decker, 2006). The data do have some limitations (Straker, 1999); for example, no comprehensive psychometric analyses of the data are available. However, the facility characteristics data (such as bed size) used in this analysis are generally regarded as both reliable and accurate (Abt Associates, Inc., 2004).

Model Specification

The dependent variables used in the analyses are the 15 quality measures. These are described in further detail in **Table 1**. Table 1 also shows that the quality measures have changed over time with the addition of some measures and the deletion of others, along with changes in specification for some measures. For these reasons we used 2004 and 2006 data that allowed comparisons with the greatest number of measures using the same specifications.

For each quality measure for each facility, the score in 2006 was subtracted from the score in 2004. Negative numbers indicate an increase in quality. These change scores were used in both the descriptive and multivariate analyses. For all quality measures this process reduced the number of facilities in the analyses. This occurred because nursing homes must have quality measure scores for both years if a difference score is to be calculated. Many nursing homes had blank cells for some measures, which is a known limitation of Nursing Home Compare (GAO, 2002). In the descriptive tables, we provide the number of facilities that could be matched for each quality measure. At baseline, 14,224 nursing homes were included in

the data; this figure provides some indication of the observations dropped for each analysis. Dropped facilities were systematically different from those included in the analyses; that is, they had a smaller bed size, which reveals a limitation of the analyses presented.

The quality measures were specifically chosen by the developers of Nursing Home Compare so that they could be reported with either little risk adjustment or no risk adjustment. Risk adjustment accounts for differences in the types of residents in facilities that may otherwise bias the quality measure scores. This process of choosing the quality measures and performing the risk adjustment is described further in a technical report (Abt Associates, Inc., 2004). Thus, whether it is appropriate to adjust for risk when using the quality measures in analyses is debatable. In this analysis using two time points, case-mix adjustment was used by including resident characteristics to account for any changes in resident case-mix that may have occurred during the period. Following other work in this area (Mukamel, 1997), the case-mix adjustment specifications varied slightly for each quality measure. That is, the case-mix adjustment specifications were based on prior published research specific to each quality measure.

The independent variables of interest are competition and occupancy. The Herfindahl index is used as a measure of competition and produces scores from 0 to 1, with higher scores indicating less competition (i.e., a score of 1 represents a monopoly market). The county was the market area used in this analysis, and the Herfindahl index was calculated by taking each nursing home's squared percentage-share of beds in the county and summing for all nursing homes in the county. The Herfindahl index is routinely used by the federal government in analyzing market concentration effects of mergers and is consistently used by researchers (Bourbonniere et al., 2006; Harrington & Swan, 2003; Kash, Castle, & Hawes, 2006). Indeed, almost all nursing home investigations of competition have used this index. The average occupancy rate in the county is used as a measure of excess supply. The occupancy rate represents the number of residents divided by the number of beds.

In addition, in sensitivity analyses the interaction between occupancy and competition was included because markets with both low occupancy and high competition could respond

Table 1. Quality Measures Used in Nursing Home Compare (2002–2006)

Type of Resident	Quality Measures	2002	2003	2004	2005	2006
Long stay	Percent of residents whose need for help with daily activities has increased	Y	Y	Y	Y	Y
	Percent of residents who have moderate to severe pain	Y	Y	Y, R	Y, R	Y, R
	Percent of residents with pressure ulcers	Y	Y			
	Percent of residents with pressure ulcers (adjusted)	Y, F	Y, F			
	Percent of high-risk residents who have pressure sores			Y	Y	Y
	Percent of low-risk residents who have pressure sores			Y	Y	Y
	Percent of residents who were physically restrained		Y	Y	Y	Y
	Percent of residents who are more depressed or anxious			Y	Y	Y
	Percent of low-risk residents who lose control of their bowels or bladders			Y	Y	Y
	Percent of residents who have or had catheters inserted and left in their bladders			Y	Y	Y
	Percent of residents who spent most of their time in beds or in chairs			Y	Y	Y
	Percent of residents whose ability to move about in and around their rooms got worse			Y	Y	Y
	Percent of residents with infections	Y	Y			
	Percent of residents with urinary tract infections		Y	Y	Y	Y
	Percent of residents who lose too much weight			Y	Y	Y
Short stay	Percent of residents with delirium	Y, F	Y, F	Y	Y	Y
	Percent of residents who had moderate to severe pain	Y	Y	Y	Y	Y
	Percent of residents with improvement in walking	Y	Y			
	Percent of residents with pressure sores			Y	Y	Y

Note. F = facility admission profile used in risk adjustment, R = resident risk adjustment, Y = quality measure was reported in this year. The measures for long-stay residents are also known as chronic care measures and apply to any resident with a full or quarterly Minimum Data Set (MDS). The measures for short-stay residents are also known as postacute measures and apply to any resident with a 14-day MDS in the last 6 months.

Source. Centers for Medicare and Medicaid Services, 2004.

differently from those with just one of these market conditions. Only one quality measure was significant (percentage of residents with urinary tract infections). These analyses were therefore not reported, and the interactions were not included in any of the final analytic models.

In all cases for the multivariate analyses, these independent variables of interest (competition and occupancy) were recoded as ordinal categorical variables using the decile distributions. Using categorical variables enables an easier interpretation of the odds ratio, and the odds ratio for the first decile is reported because if competition and occupancy

influence the quality measure scores, they are likely to do so at the most extreme points of the distributions.

Analyses

Data from both years were combined, using the facility identification number and then subtracting each 2006 quality measure score from the 2004 quality measure score in order to explore the changes over a 2-year period. In the descriptive analyses, aggregate changes in quality measure scores (i.e., mean change scores and relative change scores) are presented first. Second, the baseline quality measure scores (i.e., highest 10% of scores and lowest 10% of

scores) are stratified and the change scores reported. This approach provides some descriptive information on whether regression to the mean is occurring. That is, a pattern suggesting regression to the mean would be some increase for extremely low scores and some decrease for extremely high scores.

To quantify the influence of regression to the mean for each quality measure, a previously described analytic approach was used (Barnett et al., 2005). This approach shows the computations and score adjustments necessary to account for regression to the mean in similar data. Using the same units as the quality measures, the computation gives a measure of regression to the mean. Thus, by using the same formula for each measure for each facility, researchers can correct for this influence. The regression to the mean value can be subtracted from the observed value to give an adjusted estimate. These adjusted estimates were used in the multivariate analyses.

In the multivariate analyses, 15 weighted ordered logistic regression models were used to examine the influence of competition and occupancy on each quality measure. Ordered logistic regression was used so that improvements and declines in the quality measure scores could be examined. Thus, in these models, the quality measure scores were divided into terciles so that ordered logistic regression could be used.

Analyses using the quality measure scores as continuous variables could also be employed; however, the quality measures are not normally distributed and require transformation. The resulting analyses become somewhat difficult to interpret. Ordered logistic regression has little loss of efficiency when the data are collapsed into categories and has the added advantage of providing easily understood odds ratios. The odds ratios are interpreted as the effect of the predictor variable on the odds of being in a higher tercile group rather than a lower tercile group.

Given that larger nursing homes have more residents to whom the quality measures apply, the quality measures are likely more robust in larger facilities. Therefore, the analyses are weighted by the facility bed size, so the analyses control for heterogeneity of variance. In order to account for possible correlation of quality within markets that can bias the standard errors of the estimates, the Huber-White sandwich estimator (i.e., robust standard errors) clustered by county was used.

Aggregate resident factors used as independent variables for case-mix adjustment include activities of daily living (ADLs), bladder incontinence, bowel incontinence, and mental health problems. Staffing levels within facilities were controlled for because increased staffing levels will enable individual staff members to increase the time they spend in direct resident care and, in turn, will benefit residents (Abt Associates, Inc., 2004). We include full-time equivalents per 100 residents of nurse aides, licensed practical nurses, and registered nurses. We know from other nursing home studies that facility factors (in addition to staffing levels) have a strong impact on quality indicators (Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005). Therefore, profit status, chain membership, bed size, and Medicaid census are included as facility-level variables.

Results

Table 2 shows the mean scores for each of the quality measures in 2004 and 2006, as well as the average and relative changes in these scores. Nine measures show an average decrease in scores (i.e., better quality), five measures show an average increase in scores (i.e., worse quality), and one measure shows no change. In most cases, these changes averaged less than 1%, although 14 of the 15 change scores were statistically significant, and the relative changes in some cases were substantial. For example, the percent of short-stay residents who had moderate to severe pain in 2006 showed a relative 20% average improvement over the 2004 scores.

The quality measure change scores are stratified in **Table 3** by the initial (baseline) values. In all cases, the lowest scoring facilities showed a large average increase in quality measure scores, whereas the highest scoring facilities showed a large average decrease in quality measure scores. These descriptive results indicate that regression to the mean may be occurring.

Table 4 quantifies the regression to the mean. That is, for each quality measure, regression to the mean was evident. For example, for the percentage of residents whose need for help with ADLs has increased and for facilities with low baseline scores, the regression to the mean value is 3.53. The observed average value from **Table 3** is 7.31. Therefore, the adjusted estimate of the actual change score after accounting for regression to the mean is 3.78 (i.e., 7.31 minus 3.53).

Table 2. Change in Quality Measure Scores

Quality Measures	n	Mean Values in 2004	Mean Values in 2006	Change**	Relative Change	p Value
Percent of residents whose need for help with daily activities has increased	11,202	15.39	15.68	.29	2%*	.0013
Percent of residents who have moderate to severe pain	11,626	6.32	5.03	-1.29	-20%*	.0000
Percent of high-risk residents who have pressure sores	8,457	13.43	12.80	-.63	-5%*	.0000
Percent of low-risk residents who have pressure sores	5,315	2.59	2.42	-.17	-7%*	.0003
Percent of residents who were physically restrained	11,743	7.26	6.13	-1.14	-16%*	.0000
Percent of residents who are more depressed or anxious	11,683	14.66	14.45	-.21	-1%*	.0128
Percent of low-risk residents who lose control of their bowels or bladders	9,831	47.68	48.66	.98	2%*	.0000
Percent of residents who have or had catheters inserted and left in their bladders	11,635	5.91	5.79	-.12	-2%*	.0005
Percent of residents who spent most of their time in beds or in chairs	11,732	4.21	4.21	0	0%	.9167
Percent of residents whose ability to move about in and around their rooms got worse	9,839	12.18	12.56	.37	3%*	.0000
Percent of residents with urinary tract infections	11,747	8.64	8.74	.11	1%*	.0390
Percent of residents who lose too much weight	11,590	8.63	8.73	.10	1%	.0676
Percent of short-stay residents with delirium	8,726	2.97	2.31	-.66	-22%*	.0000
Percent of short-stay residents who had moderate to severe pain	8,792	23.11	21.47	-1.64	-7%*	.0000
Percent of short-stay residents with pressure sores	7,900	19.16	18.39	-.76	-4%*	.0000

*Significant level of .05 using a paired t test

**Change = 2006 values minus 2004 values. Negative scores in mean change indicate improved quality.

Results from the 15 ordered logistic regression models used to examine the influence of competition and excess supply on the quality measure scores are shown in **Table 5**. The adjusted odds ratios (AORs) are reported for facilities in markets with the highest competition (i.e., top decile) and lowest occupancy (i.e., bottom decile). In markets with high competition, eight quality measures show significant AORs, indicating an association between higher competition and lower quality measure scores (i.e., better quality). For example, the scores for the percentage of short-stay residents who are more depressed or anxious are likely to be lower in the most competitive markets (indicating better quality). In markets with lower occupancy rates, 10 quality measures show significant AORs, indicating an association between lower occupancy and lower quality measure scores. For example, the scores for the percentage of short-stay residents with urinary tract infections are likely to be lower in the lowest occupancy markets (indicating better quality).

Discussion

The analyses show that over a 2-year period, the scores for nine quality measures had declined slightly, indicating improved quality, whereas five scores had increased slightly, indicating decreased quality. The change scores are sensitive to regression to the mean. Nevertheless, regression to the mean does not explain all of the change scores identified, and facilities operating in highly competitive markets or markets with excess supply are much more likely to improve their quality measures. Thus, some nursing homes may have improved care for some residents.

Implications for Management, Practice, and Policy

Understanding whether Nursing Home Compare has influenced change in the nursing home industry is important for at least four reasons. First, the Nursing Home Compare report card was an expensive endeavor. Second, Nursing Home Compare is indicative of the consumer empowerment policies that the U.S. government is currently pursuing in

Table 3. Change in Quality Measure Scores for High- and Low-Baseline Scores

Quality Measures	n	Mean Values in 2004	Mean Values in 2006	Change**
Facilities with lowest 10% of baseline scores				
Percent of residents whose need for help with daily activities has increased	903	3.36	10.67	7.31*
Percent of residents who have moderate to severe pain	868	0	2.44	2.44*
Percent of high-risk residents who have pressure sores	699	2.54	7.64	5.10*
Percent of low-risk residents who have pressure sores	1,793	0	1.83	1.83*
Percent of residents who were physically restrained	2,246	0	1.15	1.15*
Percent of residents who are more depressed or anxious	1,086	2.61	7.98	5.37*
Percent of low-risk residents who lose control of their bowels or bladders	902	20.47	28.32	7.85*
Percent of residents who have or had catheters inserted and left in their bladders	1,162	.42	2.68	2.26*
Percent of residents who spent most of their time in beds or in chairs	2,967	0	1.36	1.36*
Percent of residents whose ability to move about in and around their rooms got worse	947	2.61	8.60	5.99*
Percent of residents with urinary tract infections	1,205	1.13	5.13	4.00*
Percent of residents who lose too much weight	1,442	1.88	6.62	4.74*
Percent of short-stay residents with delirium	3,343	0	1.44	1.44*
Percent of short-stay residents who had moderate to severe pain	796	2.66	10.59	7.93*
Percent of short-stay residents with pressure sores	791	5.62	13.41	7.79*
Facilities with highest 10% of baseline scores				
Percent of residents whose need for help with daily activities has increased	1,133	33.00	20.96	-11.74*
Percent of residents who have moderate to severe pain	1,208	19.31	9.89	-9.42*
Percent of high-risk residents who have pressure sores	927	27.30	19.00	-8.30*
Percent of low-risk residents who have pressure sores	717	7.91	3.48	-4.43*
Percent of residents who were physically restrained	1,195	24.58	16.68	-7.90*
Percent of residents who are more depressed or anxious	1,184	33.62	22.96	-10.66*
Percent of low-risk residents who lose control of their bowels or bladders	976	72.58	66.61	-5.97*
Percent of residents who have or had catheters inserted and left in their bladders	1,006	14.93	10.87	-4.06*
Percent of residents who spent most of their time in beds or in chairs	1,181	16.54	12.71	-3.83*
Percent of residents whose ability to move about in and around their rooms got worse	1,158	26.08	17.68	-8.40*
Percent of residents with urinary tract infections	1,186	19.19	13.10	-6.09*
Percent of residents who lose too much weight	1,268	17.99	10.91	-7.08*
Percent of short-stay residents with delirium	739	13.65	5.45	-8.20*
Percent of short-stay residents who had moderate to severe pain	922	51.40	36.00	-15.40*
Percent of short-stay residents with pressure sores	848	38.02	27.64	-10.38*

*Significant level of .05 using a paired *t* test.

**Change = 2006 values minus 2004 values. Negative scores in mean change indicate improved quality.

healthcare. Third, if the quality measure scores are sensitive to competition and excess supply (as the consumer-choice model would predict), this finding is likely a harbinger of future gains. Fourth, some of these findings may be generalizable to long-term care initiatives outside of the United States.

The Nursing Home Compare report card was the result of years of research and demonstration projects in several states (GAO, 2002). The researchers in this study could not find any information regarding the cost of Nursing Home Compare, but one could imagine the costs to be in the tens of millions of dollars. Ensuring that some benefits result from expenditure of these public monies would seem a

reasonable goal. Previous accounts of beneficial changes in the quality measures probably did not account for regression to the mean (i.e., the changes seen may have been random rather than systematic). Given that this study did find improvements in some quality measures, it would appear that some benefits from this initiative are accruing.

It was recently estimated that the survey and certification process costs the government nearly \$400 million annually, which equates to about \$22,000 per nursing home or \$208 per nursing home bed (Walshe & Harrington, 2003). Surveyors across the nation spend 4 million hours in nursing homes each year. However, the results of these efforts are generally regarded as

Table 4. Regression to the Mean (RTM) for Each Quality Measure from 2004 to 2006

Quality Measures	n	Low Baseline (2004) RTM	High Baseline (2004) RTM
Percent of residents whose need for help with daily activities has increased	11,202	3.53	3.94
Percent of residents who have moderate to severe pain	11,626	1.97	2.74
Percent of high-risk residents who have pressure sores	8,457	3.00	3.39
Percent of low-risk residents who have pressure sores	5,315	1.04	1.24
Percent of residents who were physically restrained	11,743	2.78	3.75
Percent of residents who are more depressed or anxious	11,683	3.66	4.27
Percent of low-risk residents who lose control of their bowels or bladders	9,831	6.71	6.64
Percent of residents who have or had catheters inserted and left in their bladders	11,635	1.55	1.82
Percent of residents who spent most of their time in beds or in chairs	11,732	1.88	2.41
Percent of residents whose ability to move about in and around their rooms got worse	9,839	2.85	3.12
Percent of residents with urinary tract infections	11,747	2.16	2.50
Percent of residents who lose too much weight	11,590	1.88	2.22
Percent of short-stay residents with delirium	8,726	1.30	2.08
Percent of short-stay residents who had moderate to severe pain	8,792	5.98	6.93
Percent of short-stay residents with pressure sores	7,900	3.80	4.31

Note. The RTM value was defined when repeated measurements were observed in the same subject; relatively high or relatively low observations are likely to be followed by less extreme ones nearer the subject's true mean. The RTM value has the same scale as the original value of quality measurements.

poor (Walshe, 2001). It is clear that, rather than promoting quality improvement, the regulatory approach has facilitated the creation of a quality floor. The current regulatory system may be a necessary but not a sufficient mechanism for quality improvement. The solution implemented by the current administration was to foster consumer empowerment strategies (of which Nursing Home Compare is a part). Nevertheless, little evidence to date indicates that consumer empowerment policies complement the regulatory approach in encouraging quality improvement. The findings reported in this article may be among the first showing some benefits to this approach.

As policies promoting increased competition in the long-term care market (such as home- and community-based waivers) proceed and other providers (such as assisted living providers) expand, we will likely see changes in many more markets toward increased competition and lower occupancy. Moreover, more generic "aging-in-place" initiatives also promote the use of home services or services such as residential care and attempt to delay nursing home use (Chapin & Dobbs-Kepper, 2001). Because the quality measure scores are sensitive to competition and excess supply,

the results reported here likely represent a harbinger of future quality gains.

The findings also have implications for quality management practice. Improvements in the quality measure scores likely result from actions taken by nursing home administrators. These actions may include hiring more staff, hiring a different mix of staff, and training staff. Actions may also include implementing quality improvement activities, focusing staff more on quality, and hiring quality management staff. We do not know which actions have been taken, but our results clearly indicate that in some markets (i.e., where high competition and low supply exist) administrators should implement some initiatives in this area or risk declining census and possible closure. A clear financial return on investment exists for quality enhancements in this area (Kilpatrick et al., 2005).

The U.S. nursing home market is dissimilar in many respects from nursing home markets in most other countries. Nevertheless, some competition between nursing homes and some competition from other long-term care providers would appear to be a commonality. As such, these study findings may be representative of the influence that

Table 5. Multivariate Ordered Logistic Model Results Examining the Influence of Competition and Occupancy on Quality Measure Scores

Quality Measures	n	Competition ¹		Occupancy ²	
		AOR [†]	95% CI	AOR [†]	95% CI
Percent of residents whose need for help with daily activities has increased ³	11,202	0.69	0.55–0.85***	0.79	0.67–0.94**
Percent of residents who have moderate to severe pain ³	11,626	1.05	0.84–1.12	1.10	0.87–1.39
Percent of high-risk residents who have pressure sores ³	8,457	0.45	0.19–0.77***	0.90	0.68–1.19
Percent of low-risk residents who have pressure sores ³	5,315	0.89	0.69–1.14	0.61	0.45–0.82***
Percent of residents who were physically restrained ³	11,743	1.41	0.86–2.32	0.90	0.71–0.96**
Percent of residents who are more depressed or anxious ³	11,683	0.77	0.63–0.97**	0.81	0.68–0.96*
Percent of low-risk residents who lose control of their bowels or bladders ³	9,831	0.95	0.59–1.52	0.84	0.67–0.99*
Percent of residents who have or had a catheters inserted and left in their bladders ³	11,635	1.02	0.90–1.15	0.99	0.82–1.19
Percent of residents who spent most of their time in beds or in chairs ³	11,732	0.94	0.87–0.99*	0.93	0.75–1.16
Percent of residents whose ability to move about in and around their rooms got worse ³	9,839	0.96	0.79–1.17	0.72	0.58–0.89**
Percent of residents with urinary tract infections ³	11,747	0.85	0.61–0.97*	0.82	0.72–0.95**
Percent of residents who lose too much weight ³	11,590	0.43	0.29–0.85*	0.89	0.59–0.99*
Percent of short-stay residents with delirium ³	8,726	0.97	0.77–0.99*	0.81	0.69–0.95*
Percent of short-stay residents who had moderate to severe pain ³	8,792	0.81	0.67–0.98**	1.10	0.91–1.32
Percent of short-stay residents with pressure sores ³	7,900	0.93	0.59–1.46	0.81	0.63–0.99*

Note. CI = confidence interval; AOR = adjusted odds ratio. The analyses are adjusted for clustering within markets. The total number of the facilities is 14,224. However, for each of the 15 quality measures only those facilities with scores available in both years for calculating the difference are included.

[†]The analyses are coded such that AORs less than 1 indicate that high competition is associated with improved quality measure scores (i.e., better quality).

²The analyses are coded such that AORs greater than 1 indicate that low occupancy is associated with improved quality measure scores (i.e., better quality).

³The odds ratios represent a one-unit (i.e., percent) change in the quality measure.

[†]AOR results are reported for the highest decile compared to the lowest decile.

*Statistically significant AOR at the $p \leq .05$ level. **Statistically significant AOR at the $p \leq .01$ level. ***Statistically significant AOR at the $p \leq .001$ level.

quality-of-care report cards could have in other countries.

Limitations

Nursing home quality is a multidimensional construct, and a very wide array of quality indicators exist. Nursing Home Compare includes only a small subset of these indicators. One limitation of the analysis in this study is that nursing homes could be altering their quality in other areas, and this would not be reflected in our findings.

The analysis is also limited in the attribution of the findings to Nursing Home Compare. That is, quality changes may not necessarily be attributable to the publishing of the report card. Initiatives to improve quality, such as use of total quality measurement, may have

independently influenced the quality measures. Some nursing homes are also participating in national quality improvement initiatives, such as those developed by the Medicare Quality Improvement Organization Program, and CMS-sponsored initiatives, such as pain management (CMS, 2004). These initiatives may have also influenced the quality changes identified. It may be possible for future research to identify facilities participating in these programs and further refine the analytic models by controlling for such participation.

Reported here are the results identified for the most competitive and lowest occupancy markets. As such, the findings are the most favorable possible with regard to their significance and strength. Indeed, in all cases the odds ratios were smaller for the second decile,

and 16 were significant (versus 20 in the first decile).

We also do not know whether the influence of this report card stems directly from consumers or from other sources. In nursing home selection, potential residents often do not have any choice of setting. This decision is made by hospital discharge planners, insurance contracts with nursing homes for skilled services, and nursing home-to-hospital relationships (Castle, 2003). Further research on who uses Nursing Home Compare may be useful.

As stated previously, it may be that nursing homes have gotten better at completing the MDS that is used to construct the Nursing Home Compare quality measures. As such, actual levels of quality may not have changed. For each measure the data are rounded to the nearest whole number, which can desensitize the comparisons across time. The data are also presented as league tables, and some recent research would suggest that other presentation formats may be more accurate (Marshall, Mohammed, & Rouse, 2004).

Conclusion

Researchers in this investigation determined that, in general, the scores for Nursing Home Compare may be subject to some regression to the mean. However, in more competitive areas and in those with lower occupancy rates, the evaluations in Nursing Home Compare may have brought about true improvements in quality of care in some nursing homes. During the 2 years used in this analysis, several statistically significant quality gains were identified; however, from a practical standpoint, many of these quality gains were small. Nevertheless, as policies to promote more competition in long-term care proceed, further reducing occupancy rates, we will likely see small quality gains in the future.

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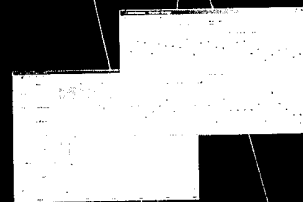
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