The Gerontologist
Vol. 47, No. 5, 650–661

Nursing Home Staff Turnover: Impact on Nursing Home Compare Quality Measures

Nicholas G. Castle, PhD,[1] John Engberg, PhD,[2] and Aiju Men, MS[1]

Purpose: We used data from a large sample of nursing homes to examine the association between staff turnover and quality. ***Design and Methods:*** The staff turnover measures came from primary data collected from 2,840 nursing homes in 2004 (representing a 71% response rate). Data collection included measures for nurse aides, licensed practical nurses, and registered nurses. We examined 14 indicators of care quality that came from the Nursing Home Compare Web site. ***Results:*** We found that reducing turnover from high to medium levels was associated with increased quality, but the evidence was mixed regarding the quality improvements from further lowering turnover to low levels. ***Implications:*** Our investigation shows that the relationship between turnover and quality might not be linear. Nevertheless, in general, high turnover is associated with poor quality.

Key Words: Nursing homes, Quality, Turnover, Staffing, Report cards

The high rate of caregiver turnover in nursing homes is a perennial issue of concern, spanning the past 30 years (e.g., Castle & Engberg, 2005; Cohen-Mansfield, 1997; Knapp & Missiakoulis, 1983; Phillips, 1987; Schwartz, 1974). Turnover of nurse aides (NAs) is especially high. Recent studies have cited average annual NA turnover rates to be more than 100% in many facilities (Castle & Engberg, 2005), with some nursing homes having rates as high as 400% (Decker et al., 2003). Not surprisingly, nearly all state Medicaid agencies and units on aging consider NA turnover to be a major workforce issue (North Carolina Division of Facility Services, 2000).

Address correspondence to Nicholas G. Castle, Graduate School of Public Health, University of Pittsburgh, A610 Crabtree Hall, 130 DeSoto Street, Pittsburgh, PA 15261. E-mail: CASTLEN@Pitt.edu
[1]Graduate School of Public Health, University of Pittsburgh, Pittsburgh, PA.
[2]RAND, Pittsburgh, PA.

This high level of caregiver turnover has caused concern because nursing home care is inherently labor intensive. When care is labor intensive, high staff turnover can have far-reaching consequences, including increased facility operating costs and lower caregiver job satisfaction (Caudill & Patrick, 1991; Parsons, Simmons, Penn, & Furlough, 2003). The most serious consequence of caregiver turnover is the potential negative health outcomes for residents.

The belief that caregiver turnover influences quality is pervasive (e.g., Knapp & Missiakoulis, 1983; Phillips, 1987; Straker & Atchley, 1999). Indeed, this belief is so pervasive that experts often use caregiver turnover in nursing homes itself as a quality indicator (e.g., Phillips, Spector, & Takada, 1988). Also, as recently described by Castle (2006), caregiver turnover measures may soon be publicly reported as quality indicators (see also Centers for Medicare & Medicaid Services [CMS], 2001). Nonetheless, as we show here, based on empirical studies in the literature this may be premature, as the association between nursing home caregiver turnover and quality is generally inconclusive. Some further research in this area is clearly warranted, and, as such, in the research presented here we examine this association using a large nationally representative sample of nursing homes.

Literature Review

Revans (1964), using hospital staff, provided one of the first insights into the association between staff turnover and quality of care. In our literature review, we searched for studies that had examined the association between nursing home caregiver turnover and quality measures. Table 1 shows the results of this literature search.

Despite the large body of studies examining caregiver turnover in nursing homes (we identified 49 studies from 1980 to 2005, many of which were reviewed by Castle, 2006), we identified few that had examined the impact of caregiver turnover on quality. We identified no studies that showed a significant relationship between NA turnover and quality of care or between licensed practical nurse (LPN)

Table 1. Consequences of Staff Turnover in Nursing Homes

Author(s)	Findings Significant (+) or Not (−) Data Source [$p < .05$]	Variables Examined	Sample Size and Data Source
Nurse aides			
Halbur & Fears (1986)	−	Resident discharge rate	Primary data from 122 facilities in NC
	−	Death rate	
Spector & Takada (1991)	−	Functional improvement	80 facilities (survey and certification data) and 2,500 residents (primary data) in RI
	−	Death	
	−	Functional decline	
Licensed practical nurses			
Halbur & Fears (1986)	−	Resident discharge rate	Primary data from 122 facilities in NC
	−	Death rate	
Spector & Takada (1991)	−	Functional improvement	80 facilities (survey and certification data) and 2,500 residents (primary data) in RI
	−	Death	
	−	Functional decline	
Zimmerman et al. (2002)	−	Infection rates	Primary data from 59 facilities and 2,015 residents in MD
	−	Hospitalization	
Registered nurses			
Halbur & Fears (1986)	+[a]	Resident discharge rate	Primary data from 122 facilities in NC
	−	Death rate	
Spector & Takada (1991)	+[a]	Functional improvement	80 facilities (survey and certification data) and 2,500 residents (primary data) in RI
	−	Death	
	−	Functional decline	
Zimmerman et al. (2002)	+[a]	Infection rates	Primary data from 59 facilities and 2,015 residents in MD
	+[a]	Hospitalization	
Castle & Engberg (2005)	+[a,b]	Physical restraint	Primary data from 354 facilities in 4 states
	+[a,c]	Catheter use	
	+[a,d]	Contractures	
	+[a,d]	Pressure ulcers	
	+[a,b]	Psychoactive drug use	
	+[a,d]	Deficiency citations	
	+[a]	Quality index	
Nurse aides and licensed practical nurses combined			
Castle & Engberg (2005)	+[a,b]	Physical restraint	Primary data from 354 facilities in 4 states
	+[a,b]	Catheter use	
	+[a,b]	Contractures	
	+[a,b]	Pressure ulcers	
	+[a,b]	Psychoactive drug use	
	−	Deficiency citations	
	+[a]	Quality index	
All staff combined			
Monroe (1990)[e]	+[a]	Health related deficiencies	Medicare cost reports from 455 facilities in CA
Harrington & Swan (2003)	+[a]	Resident activities of daily living dependency	Three secondary data sources from 1,155 facilities in CA

Notes: [a]Findings showed a positive association with the quality measure (i.e., higher turnover rates were associated with lower quality).

[b]Three turnover measures were used in examining this quality indicator; significant findings were found for one of the three measures.

[c]Three turnover measures were used in examining this quality indicator; significant findings were found for all three of the measures.

[d]Three turnover measures were used in examining this quality indicator; significant findings were found for two of the three measures.

[e]Used a significance level of $p < .10$.

turnover and quality of care. However, Castle and Engberg (2005) did show that combined NA and LPN turnover rates were associated with several quality indicators. In this case, examining combined NA and LPN turnover, the authors used three measures (i.e., low, medium, and high turnover) for each of seven quality indicators; 6 of these 21 coefficients were statistically significant (Castle & Engberg, 2005).

We identified four studies that had examined registered nurse (RN) turnover (Castle & Engberg, 2005; Halbur & Fears, 1986; Spector & Takada, 1991; Zimmerman, Gruber-Baldini, Hebel, Sloane, & Magaziner, 2002). In all four cases, RN turnover was associated with some quality indicators; however, not all of the quality indicators examined in these studies were statistically significant. Spector and Takada, for example, found an association between higher RN turnover and lower functional improvement of residents, but they found no association for death rates or functional decline. Zimmerman and associates identified an association between higher RN turnover and more resident infection rates and hospitalization. Castle and Engberg (2005), using three measures (i.e., low, medium, and high turnover), found RN turnover rates to be associated with 13 of the 21 quality indicator coefficients examined.

Monroe (1990) found turnover to be associated ($p = .08$) with the number of health-related deficiencies. However, Monroe examined turnover of all facility staff, and not just NAs. Harrington and Swan (2003) found turnover to be associated with activity of daily living dependency of residents. Again, however, staff were grouped together in the turnover rate (in this case directors of nursing, RNs, LPNs, and NAs turnover were combined).

There are a number of reasons why the findings of prior studies could be so inconclusive. First, for the most part, these studies had limited sample sizes and were limited to facilities from a single state. Second, as recently described in the literature (Castle, 2006), the definition of turnover rates in the past varied across studies, and as a consequence many studies may have had significant measurement error (Castle, 2006). Third, there is no reason to believe that the relationship between turnover and quality is linear. That is, low levels of turnover may not influence quality, and researchers may only see a significant influence at high levels.

One of the largest studies to date examining turnover and quality is the research conducted by Castle and Engberg (2005). These authors addressed many limitations of prior studies, as they used a carefully constructed definition of turnover and examined the nonlinear relationship between turnover and quality. Nevertheless, even in this study only 19 of a total of 42 quality indicators were significant (Castle & Engberg, 2005). This may be because the sample size used by these authors was relatively small, and, with data from only six states, the representativeness of the findings was limited. Castle and Engberg examined the nonlinear relationship between turnover and quality using a functional form derived from the literature rather than coming from the data. Also, these authors did not specifically examine NA turnover, which may be significant given both the importance of the care provided by NAs and their generally high rates of turnover. In addition, Castle and Engberg (2005) used quality indicators coming from Online Survey, Certification and Reporting (OSCAR) data, which are known to be imprecise measures of quality.

In this analysis, we followed several of the same methods used by Castle and Engberg (2005). We used the same definition of turnover, and we examined the nonlinear relationship between turnover and quality. However, rather than simply addressing the nonlinear relationship between quality and turnover using a theoretically defined functional form, we explicitly determined the functional form between quality and turnover using the available data. We also expanded upon this previous research in several other significant ways: (a) we examined turnover of NAs, as well as LPNs and RNs; (b) we used data from a very large nationally representative sample of nursing homes; and (c) we used more precise indicators of care quality derived from the Nursing Home Compare Web site (www.Medicare.gov).

Conceptual Model and Hypotheses Examined

Knapp and Missiakoulis (1983) and Staw (1980) reviewed the implications of staff turnover. These two reviews showed that staff turnover is likely to influence resident care through at least six mechanisms. That is, turnover will likely (a) be expensive for the facility, therefore diverting dollars from care; (b) interfere with continuity of care; (c) increase the number of inexperienced workers; (d) weaken standards of care; (e) cause psychological distress for some residents; and (e) increase the workload for remaining staff. Based on these factors, we propose that higher turnover of caregivers within the nursing home will likely be associated with lower quality. However, the question of at what level of turnover this relationship occurs remains.

Given the paucity of research in this area, the level at which turnover adversely influences quality is unknown. An often-quoted level used in other industries is 50% turnover (Phillips, 1987; Straker & Atchley, 1999). This level comes from the work of Price (1977, p. 45), who determined ''any figure in excess of 50% is considered problematic for the effectiveness of the organization and perhaps for its survival.'' Castle and Engberg (2005) used this level of turnover in their study, described previously. However, we believe that this negative relationship may not necessarily occur at 50% turnover in nursing homes. In addition, turnover may be

detrimental at different levels for different staff (i.e., NAs, LPNs, or RNs). Therefore, as described, we determine the functional forms of these relationships in our analyses. Nevertheless, following previous research for all staff we hypothesized that at high levels of turnover, additional turnover would be associated with lower quality.

Some recent work in other sectors of health care has suggested that very low turnover does not necessarily decrease productivity or effectiveness (Alexander, Bloom, & Nuchols, 1994). Halbur and Fears (1986) also showed that, in nursing homes, some staff turnover can be beneficial to the organization. For example, involuntary termination of workers who abuse residents or are poor caregivers will likely improve quality of care. The level at which turnover can be beneficial will likely vary for different industries (Park, Ofori-Dankwa, & Bishop, 1994) but is commonly quoted to be between 10% and 20% (Abelson & Baysinger, 1984; Dalton & Tudor, 1979). Castle and Engberg (2005) used the higher figure (i.e., 20%) in their study, described previously. Again, following the logic of the first hypothesis, we believe that this relationship may differ for different staff (i.e., NAs, LPNs, or RNs) and may not necessarily occur at 20% turnover. Therefore, as described, we determine the functional forms of these relationships for different staff in our analyses. Nevertheless, following previous research for all staff we hypothesized that at very low levels of turnover, additional turnover of caregivers would be associated with higher quality.

To examine these hypotheses, we used a conceptual model developed by Banaszak-Holl and Hines (1996). We used this model because (a) it was developed specifically in nursing homes, and (b) other authors have successfully used similar models in the nursing home setting (e.g., Anderson, Issel, & McDaniel, 1997; Castle & Engberg, 2006). This model includes both organizational and environmental factors. Organizational factors are characteristics of the nursing home, such as bed size; environmental factors are characteristics external to the organization, such as level of competition. Banaszak-Holl and Hines did not develop this model to explain turnover of individual staff, but rather to explore very high and very low facility-level turnover. Thus, this conceptual model was germane to this investigation because we were most interested in examining the influence of aggregate (i.e., high, medium, and low) facility-level caregiver turnover on quality of care.

Methods

Sources of Data

Data used in this investigation came from four sources: (a) a survey of nursing home administrators conducted from January to June 2005, (b) the 2005 OSCAR data, (c) the 2005 Area Resource File, and (d) the 2005 Nursing Home Compare. The information regarding staff turnover came from the administrator survey, characteristics of the nursing home came from OSCAR, characteristics of the market came from the Area Resource File, and the quality measures came from Nursing Home Compare.

Nursing Home Administrator Survey.—We collected data as part of the National Nursing Home Turnover Study (NNHTS) regarding turnover of NAs, LPNs, and RNs. This primary data collection was necessary because turnover information is generally not found in commonly used secondary sources of nursing home information. We also collected information on staffing levels of these caregivers (i.e., NAs, LPNs, and RNs). This was necessary because even though this information is included as part of the OSCAR data, it is considered less reliable than most other data elements (Straker, 1999).

The NNHTS survey was sent to 4,000 nursing home administrators, and 2,840 surveys were returned with the turnover section complete (response rate = 71%). As the name suggests, the NNHTS survey primarily collected information on turnover. We created the mailing sample by using information from the OSCAR data (described further in the next section). We retained the OSCAR facility identification numbers so that we could subsequently match this primary data back with OSCAR and examine the facility characteristics of the sample. We excluded small nursing homes (<30 beds) from the sample because their measured turnover rates would have had a low signal-to-noise ratio. In order to ensure that the sample included a sufficient number of facilities with relatively high and relatively low turnover, we stratified the sample frame based on county unemployment rates, using the average unemployment rate in 2004 as reported by the Bureau of Labor Statistics. We used a third of the sample from the bottom 10% tail of the unemployment distribution (<3.7% unemployment), a third from the top 10% tail (>8.0% unemployment), and a third from the middle 80%. This provided adequate variation in local unemployment rates.

OSCAR.—OSCAR data comes from the Medicare and/or Medicaid certification process conducted by state licensure and certification agencies on a yearly basis. These data include most (97%) facilities in the United States. In 2005, approximately 17,000 facilities were included in the data, including all of the facilities used in this analysis. There are approximately 300 data elements in OSCAR, although this investigation used only data pertaining to characteristics of the facility, such as chain membership, occupancy rate, and ownership.

Researchers often use OSCAR data as a secondary source of nursing home characteristics, and some

Table 2. Quality Measures Used in Nursing Home Compare in 2004

Type of Resident	Measure	Risk Adjustment
Long stay[a]	Percent need for help with daily activities increased	None
	Percent with moderate to severe pain	Resident level[b]
	Percent high-risk residents with pressure sores	None
	Percent low-risk residents with pressure sores	None
	Percent physical restraint use	None
	Percent more depressed or anxious	Resident level[b]
	Percent low-risk residents with loss of bladder or bowel control	None
	Percent had a catheter inserted and left in bladder	None
	Percent spend most of the time in bed or in a chair	None
	Percent ability to move in/around room got worse	Resident level[b]
	Percent with urinary tract infection	None
Short stay[c]	Percent with delirium	Resident level[b]
	Percent with moderate to severe pain	Resident level[b]
	Percent with pressure sores	Resident level[b]

Notes: [a]Defined as residents with a Minimum Data Set assessment completed at 90 days or more.
[b]Individual resident factors are included to control for confounding effects that might be attributed to differences in resident populations, and in some cases facility characteristics are included to control for confounding effects that might be attributed to some facilities admitting (specializing) in more impaired residents than other facilities.
[c]Defined as residents with a Minimum Data Set assessment completed at day 15 or fewer.

data elements are available to the public on the CMS Web site. Indeed, in recent years both state and federal governments have used OSCAR data to produce Web-based nursing home report cards (Harrington, O'Meara, Kitchener, Simon, & Schnelle, 2003). Most significantly, some OSCAR data elements are included in the federal Nursing Home Compare report card initiative (Mukamel & Spector, 2003). Many data elements are considered reliable (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000), and a recent long-term-care expert panel has recommended OSCAR for more extensive use (Institute of Medicine, 2001).

Area Resource File.—Area Resource File data are compiled from a number of data sources, including the American Hospital Association annual hospital survey, the U.S. Census of Population and Housing, the Centers for Disease Control and Prevention, and the National Center for Health Statistics. These data are aggregated at the county level. We used these data to examine the level of nursing home competition in each county.

Nursing Home Compare.—The Nursing Home Compare report card is a Web-based system created by CMS that provides information on virtually every nursing home in the United States (www.Medicare.gov). This initiative began in a small way in 1998 and only included citations from the survey and certification process. In April 2002, CMS expanded Nursing Home Compare by including several quality measures. The quality measures are based on individual resident data found in the Minimum Data Set. A General Accounting Office report (General Accounting Office, 2002) describes the development of these measures. At the time the primary data were collected for this study (i.e., 2004), 14 quality measures were reported on Nursing Home Compare. Table 2 shows all of these quality measures.

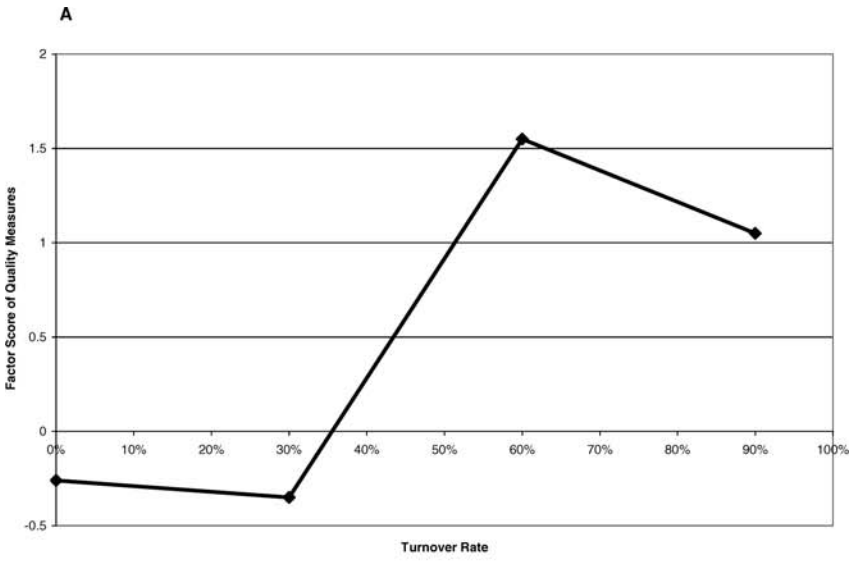
Analyses

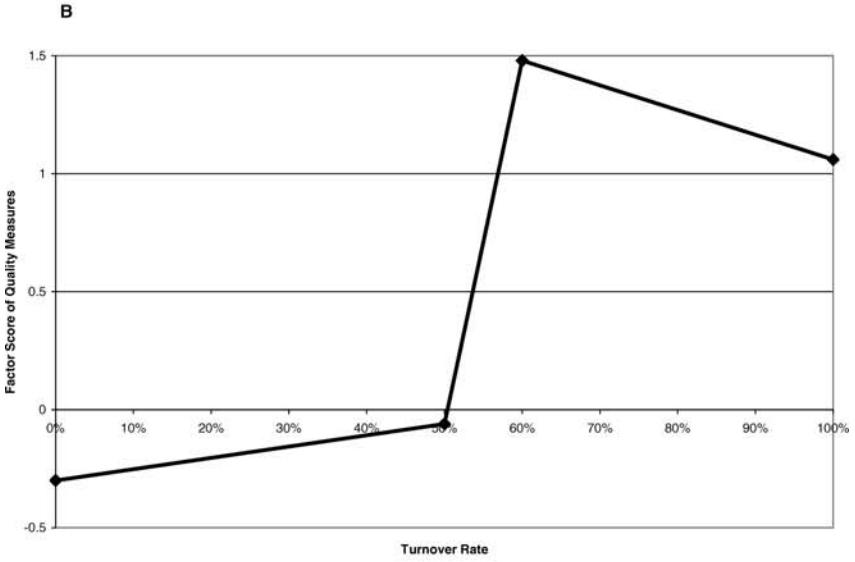
The information in the OSCAR data is lagged by approximately 12 months and the Nursing Home Compare information by approximately 3 months. Our primary data collection gathered information representing the period January 2004 through December 2004. Thus, because we used December 2005 OSCAR data and January 2005 through March 2005 Nursing Home Compare data, the outcomes examined occurred subsequent to staff turnover and the facility characteristics were contemporaneous with the turnover characteristics.

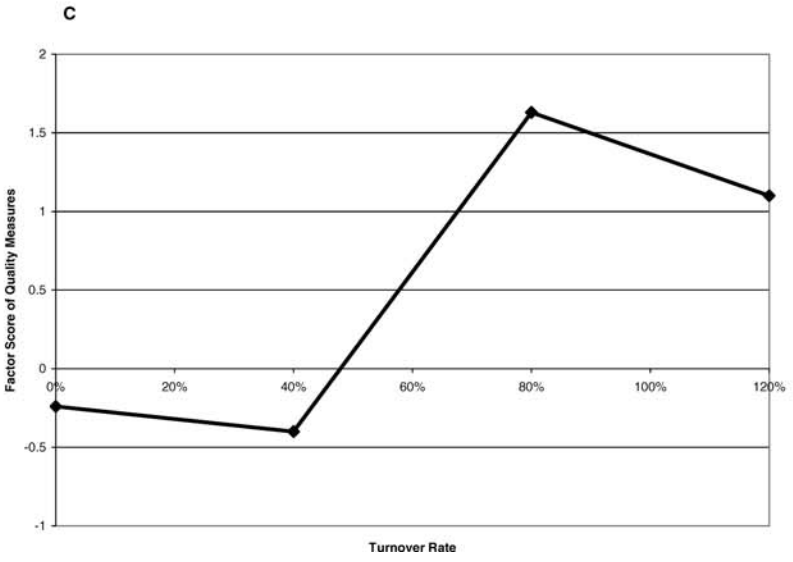
Based on the commonly used threshold value of .8, the variables showed no problems of collinearity.

→

Figure 1. Function form for turnover and quality for (A) registered nurses, (B) licensed practical nurses, and (C) nurse aides. As an example, Figure 1a shows that as registered nurse turnover increased from 0% to 30%, the overall quality factor score declined slightly from –0.2 to –0.3 (indicating a slight improvement in quality). Then, as registered nurse turnover increased from 30% to 60%, the overall quality factor score increased from –0.3 to 1.5 (indicating a large decline in quality). Finally, as registered nurse turnover further increased from 60% to 90%, the overall quality factor score declined from 1.5 to 1.1 (indicating a slight improvement in quality).







We were especially concerned with the potential correlation between the staffing-level variables and turnover variables, as high turnover could be associated with low staffing levels. We found this positive relationship, but the correlation between these variables was low. The correlation between the different categories of staff turnover was higher and averaged approximately .6.

The outcomes of interest were the 14 quality measures. We transformed these measures to create the dependent variables. The distributions of these measures were skewed, with few facilities having high values that would be an indicator of low quality. Thus, we transformed all of the quality measures to create more normally distributed outcomes. For each measure, we took the natural logarithm. This has the advantage of allowing differences in the transformed quality measures to be interpreted as percent changes in quality and permits the quality measures to be combined through exploratory factor analysis, as described below.

The exploratory factor analysis examined whether the 14 quality measures could be combined into a smaller number of measures. We estimated principal factors and examined all factors with eigenvalues greater than 1. The first principal factor had an eigenvalue of 3.93 and explained 63% of the variance of the 14 measures. Although one other factor also had an eigenvalue greater than 1 (i.e., 1.22), we limited our examination to the first factor because it captured by far the most important single dimension of quality.

Using this quality factor, we examined the functional form between turnover levels and quality. Our main interest was on the effect of the turnover variables on quality of care, so we included these variables in the regression. We also included eight other characteristics of the facilities and the markets in which they operated (described below).

In order to detect the potential nonlinear relationship between turnover and quality, we allowed the relationship to differ among the levels of turnover by using a spline functional form (also known as a piecewise linear functional form). Standard regression approaches would restrict the relationship between quality and turnover to be the same, regardless of the level of turnover. The implication would be that a small decrease in turnover would always lead to the same change in quality. A spline functional form allows the relationship to differ depending on the level of turnover. For example, at low levels of turnover, a small decrease in turnover might not be associated with any change in quality, but at high levels of turnover, a small decrease in turnover might be associated with a large increase in quality.

We chose two inflection points, also known as *knots*, that led to the three-segment spline functions that best fit the data according to Akaike's information criterion (Akaike, 1981). A three-segment spline function will allow for a variety of nonlinear shapes (such as _/‾, _/, /‾\, ‾_) or any number of other shapes that portray a relationship between turnover and quality that varies over the range of turnover values.

Figures 1A, 1B, and 1C show the actual estimated relationships. As can be seen, they were of the general form _/‾. The relationship between quality and turnover changed slope at 30% turnover and again at 60% turnover for RNs, 50% turnover and again at 60% turnover for LPNs, and 40% turnover and again at 80% turnover for NAs.

To examine the relationship between turnover and overall quality we used the quality index created using exploratory factor analysis and a set of indicator variables for three levels of turnover. The levels corresponded to the three segments of the splines defined previously. We estimated the relationship using ordinary least squares regression because the distribution of the overall quality factor was approximately normal. In order to account for possible correlation of outcomes within markets, which can bias the standard errors of the estimates, we used the Huber-White sandwich estimator clustered by county for all of the analyses.

We report the statistical significance of the indicator coefficients in the regression, but we also wanted to present evidence regarding the magnitude of the variation in quality that comes from the variation in turnover. Therefore, we also estimated spline regressions for each of the 14 quality measures and predicted their values for several levels of turnover holding all other variables at their means, and present these results.

Model Specification and Operationalization

Table 3 shows the quality measures used in the exploratory factor analysis. Our independent variables of interest were NA, LPN, and RN turnover rates. We defined turnover as the sum of terminations for 6 months divided by sum of established positions. We determined this by multiplying the number of full-time-equivalent staff by 2, to give an annual rate. This turnover rate included staff on all shifts, part-time staff, and voluntary and involuntary turnover. Recent analyses have shown that the relative difference in reported turnover rates can differ by as much as 47% depending on the definition of turnover used (Castle, 2006). A prior analysis showed that the definition of turnover (and 6-month time frame) we used had less measurement error than other definitions of turnover (Castle, 2006). In addition, interviews we conducted with 189 nursing home administrators showed this turnover measure to be managerially meaningful and easily completed using readily available information. Nevertheless, all turnover rates were self-reported by administrators, and, as is often the case with self-reported measures, we were not able to determine the validity or reliability of the reported rates.

Table 3. Independent Variables Used in Analyses

Independent Variable	Definition
Turnover characteristics of interest[a]	
RN turnover	Sum of RN terminations for 6 months divided by sum of established positions. Collected by number of FTE staff, including staff on all shifts, part-time staff, and voluntary and involuntary turnover
LPN turnover	Sum of LPN terminations for 6 months divided by sum of established positions. Collected by number of FTE staff, including staff on all shifts, part-time staff, and voluntary and involuntary turnover
NA turnover	Sum of NA terminations for 6 months divided by sum of established positions. Collected by number of FTE staff, including staff on all shifts, part-time staff, and voluntary and involuntary turnover
Organizational characteristics[b]	
RN staffing	FTE RNs per 100 residents
LPN staffing	FTE LPNs per 100 residents
NA staffing	FTE NAs per 100 residents
Organizational size	Number of beds
Ownership	For profit or not for profit
Chain	Whether member of a nursing home chain or not
Census	Average daily occupancy rate
Medicaid occupancy	Average daily Medicaid occupancy rate
Market characteristic[c]	
Competition	Herfindahl index. The sum of each facility's squared percentage share of beds in the county for all facilities in the county (0–1). Higher values indicate a less competitive market

Notes: RN = registered nurse; FTE = full-time equivalent; LPN = licensed practical nurse; NA = nurse aide.
[a]From primary data collection.
[b]From Online Survey, Certification and Reporting data.
[c]From the Area Resource File.

In examining the effects of turnover on the quality measures, we controlled for staffing, facility, and market factors. However, we did not include the severity of physical illnesses among residents (i.e., risk adjustment). This is because the Nursing Home Compare quality indicators either were already risk adjusted or were recommended to be used without further risk adjustment (General Accounting Office, 2002). Also, in sensitivity analyses (not shown), the results reported were highly similar to those including resident characteristics for risk adjustment.

We controlled for staffing levels within facilities because increased staffing levels will enable individual staff to increase the time they spend in direct resident care, and in turn will benefit residents (Harrington & Swan, 2003). We included full-time equivalents per 100 residents of NAs, LPNs, and RNs, including full-time, part-time, and temporary staff.

We know from other nursing home studies that organizational factors (in addition to staffing levels) have a strong impact on quality indicators. Therefore, we included occupancy, ownership, size, chain membership, and Medicaid census as organization-level variables (Spector & Takada, 1991). Likewise, market factors can also influence quality indicators. We included market competition from other nursing homes (Weech-Maldonado, Neff, & Mor, 2003). In sensitivity analyses (not shown) we examined other market factors, including the number of outpatient long-term-care facilities, number of hospital-based long-term-care services, number of elders, and average income in the county, but we found these to be not significant. This was not unexpected, as we had a limited number of markets in our analytic sample.

Results

In general, most items on the questionnaire were answered. Missing data occurred in less than 1% of cases and were evenly distributed across questions. Table 4 presents descriptive statistics for the variables used in the analysis. The average annual RN, LPN, and NA turnover rates were 36.1%, 37.0%, and 59.4%, respectively.

Figures 1a, 1b, and 1c show the functional form of the relationships between RN turnover and quality, LPN turnover and quality, and NA turnover and quality, respectively. As can be seen in these figures, low turnover rates had very little influence on the quality index *z* scores. Whereas an increase in RN turnover from 30% to 60% led to a 6-fold increase in the quality index score (from –0.3 to 1.5), an increase in LPN turnover from 50% to 60% led to a nearly 6-fold increase in the quality index score (from –0.2 to 1.5), and an increase in NA turnover from 40% to 80% led to a 5-fold increase in the quality index score (from –0.4 to 1.6). However, these figures also show that RN turnover rates above 60%, LPN turnover

Table 4. Descriptive Statistics of Quality Indicators, Turnover Characteristics, and Control Variables

Variable	*M* or %	*SD*
Quality indicators (%)		
Help with daily activities increased	8.8	10.1
Moderate to severe pain	5.3	11.3
High-risk residents with pressure sores	25.0	11.6
Low-risk residents with pressure sores	6.6	9.1
Physical restraint use	8.9	8.9
More depressed or anxious	13.8	5.7
Low-risk residents with loss of bladder or bowel control	48.3	11.6
Had a catheter inserted and left in bladder	7.8	7.7
Spend most of the time in bed or in a chair	9.0	9.1
Ability to move in/around room got worse	9.7	9.5
With urinary tract infection	3.8	5.5
With delirium (short stay)	15.4	12.5
With moderate to severe pain (short stay)	23.6	4.9
With pressure sores (short stay)	13.0	9.6
Turnover characteristics of interest (%)		
RN turnover	36.1	24.7
LPN turnover	37.0	37.1
NA turnover	59.4	37.0
Organizational characteristics		
FTE RNs per 100 residents, *M*	21.2	6.0
FTE LPNs per 100 residents, *M*	20.4	4.0
FTE NAs per 100 residents, *M*	31.0	10.4
Bed size, *M*	113.5	57.7
For profit (%)	57.3	
Chain membership (%)	44.1	
Average occupancy (%)	87.4	12.5
Average Medicaid occupancy (%)	66.5	19.5
Market characteristic		
Competition (Herfindahl index; *M*)	0.13	0.2

Notes: Statistics came from the analytic file consisting of 2,899 facilities and 1,118 markets. RN = registered nurse; LPN = licensed practical nurse; NA = nurse aide; FTE = full-time equivalent; *SD* = standard deviation.

Table 5. Regression Analyses Examining Staff Turnover and Quality Measures

Variable	Factor 1 Estimate (*SE*)
Turnover characteristics of interest	
RN turnover	
Medium (30%–59%)	0.212 (0.064)***
High (>60%)	0.691 (0.096)***
LPN turnover	
Medium (50%–60%)	0.905 (0.071)***
High (>60%)	0.919 (0.067)***
NA turnover	
Medium (40%–80%)	0.271 (0.066)***
High (>80%)	0.178 (0.100)*
Organizational characteristics	
FTE RNs per 100 beds	−0.014 (0.002)***
FTE LPNs per 100 beds	0.002 (0.002)
FTE NAs per 100 beds	−0.015 (0.001)***
Size	−0.000 (0.000)
For profit	−0.111 (0.035)**
Chain membership	−0.078 (0.036)*
Average occupancy	−0.996 (0.131)***
Average Medicaid occupancy	0.094 (0.083)
Market characteristic	
Competition	0.375 (0.078)***
Intercept	1.116 (0.162)***
Number of observations	2,899
R^2	0.68

Notes: RN = registered nurse; LPN = licensed practical nurse; NA = nurse aide; FTE = full-time equivalent; *SE* = standard error.
*$p < .05$; **$p < .01$; ***$p < .001$.

rates above 60%, and NA turnover rates above 80% had little further negative influence on quality.

Table 5 presents the regression model examining the quality factor from the exploratory factor analysis. We used the low turnover category as the reference group and included indicator variables for having medium turnover or having high turnover in each of the three staff categories. In each case, the low, medium, and high cutpoints came from the piecewise linear functional forms (shown in Figures 1A, 1B, and 1C). The estimates in Table 5 demonstrate that, in general, high staff turnover appeared to be associated to some degree with poor quality. For RNs, medium turnover (i.e., 30%–59% per year) and high turnover (i.e., >60% per year) were associated ($p < .001$) with worse quality factor scores. Compared with low RN turnover (i.e., <30% per year), the estimated coefficients for the quality scores were 0.212 and 0.691 higher, respectively. For LPNs, medium turnover (i.e., 50%–60% per year) and high turnover (i.e., >60% per year) were associated ($p < .001$) with worse quality factor scores. Compared with low LPN turnover (i.e., <50% per year), the estimated coefficients for the quality scores were 0.905 and 0.919 higher, respectively. For NAs, medium turnover (i.e., 40%–80% per year) and high turnover (i.e., >80% per year) were associated ($p < .001$ and $p < .05$, respectively) with worse quality factor scores. Compared with low NA turnover (i.e., <40% per year), the estimated coefficients for the quality scores were 0.271 and 0.178 higher, respectively.

Table 6 shows the predicted point estimates for each quality measure at varying levels of turnover. The results were generally consistent with what would be expected based on the functional forms described previously; nevertheless, some variability in the influence of turnover on the quality measures was evident. For example, the percentage of high-risk residents with pressure sores appeared quite sensitive to turnover for all staff, whereas the percentage of residents more depressed or anxious was less so. When NA turnover increased from the 25th percentile to the 75th percentile, the predicted percentage of high-risk residents with pressure sores increased from 26.3% to 28.9%. When the NA

Table 6. Predicted Quality for 14 Quality Measures for a Range of Turnover Rates

	Quality Measure[a]													
Turnover Rate	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nurse aide														
10% turnover[b]	10.0	4.0	26.0	7.7	3.8	5.3	38.2	5.8	7.2	4.5	3.9	20.0	15.7	14.4
25% turnover	8.7	4.3	25.9	8.3	3.8	5.6	39.0	5.9	7.8	4.6	3.5	21.0	16.2	14.3
50% turnover	9.5	5.7	28.9	10.1	5.5	6.3	41.0	7.5	9.0	6.4	4.4	22.9	16.7	15.7
75% turnover	14.6	8.6	37.1	12.7	9.6	6.9	44.3	11.1	10.4	10.9	7.8	25.8	16.7	19.3
90% turnover	15.1	8.4	37.9	12.6	9.8	6.8	44.4	11.4	10.1	11	8.2	25.7	16.5	19.3
100% turnover	14.5	7.6	37.1	11.9	9.1	6.6	43.8	11.0	9.5	10.2	8.0	25.0	16.2	18.4
25th percentile (i.e., 4% turnover)	10.5	3.9	26.3	7.4	3.8	5.1	47.9	5.8	6.9	4.5	4.0	19.8	15.5	14.4
50th percentile (i.e., 9% turnover)	10.0	4.0	26.2	7.6	3.8	5.3	48.2	5.8	7.1	4.5	3.9	20.1	15.6	14.4
75th percentile (i.e., 50% turnover)	9.5	5.7	28.9	10.1	5.5	6.3	41.0	7.5	9.0	6.4	4.4	22.9	16.7	15.7
Licensed practical nurse														
10% turnover	9.0	4.2	29.6	8.5	3.8	5.8	30.7	7.0	8.7	5.3	4.3	22.7	16.4	14.7
25% turnover	8.6	4.3	26.5	8.5	3.8	5.7	39.3	6.1	8.0	4.7	3.5	21.3	16.3	14.4
50% turnover	7.9	4.4	21.3	8.3	3.8	5.4	37.1	4.6	6.9	3.6	2.4	19.0	16.1	13.9
75% turnover	10.4	11.7	28.4	13.7	7.1	9.3	46.1	8.9	16.1	9.7	3	28.6	19.7	21.1
90% turnover	10.4	11.1	29.0	13.1	6.8	9.1	45.9	8.5	15.4	9.3	3.1	27.9	19.3	20.8
100% turnover	10.3	10.7	29.5	12.7	6.6	8.9	45.7	8.3	15.0	9.0	3.2	27.4	19.0	20.5
25th percentile (i.e., 8% turnover)	9.0	4.2	30.0	8.6	3.8	5.8	40.8	7.1	8.8	5.4	4.3	22.9	16.4	14.8
50th percentile (i.e., 13% turnover)	8.9	4.3	29.0	8.5	3.8	5.8	40.4	6.8	8.6	5.2	4.1	22.4	16.4	14.6
75th percentile (i.e., 43% turnover)	8.1	4.4	22.7	8.4	3.8	5.5	47.8	5.0	7.2	3.9	2.7	19.6	16.1	14.0
Registered nurse														
10% turnover	7.6	4.5	25.9	8.2	3.7	5.4	38.8	6.0	7.5	4.3	3.4	21.0	16.2	13.7
25% turnover	9.0	4.3	25.8	8.6	3.9	5.8	39.2	5.9	8.1	4.7	3.4	21.0	16.3	14.6
50% turnover	14.7	9.7	32.0	11.1	6.7	6.5	43.3	8.9	10.2	7.6	4.8	25.4	17.4	17.8
75% turnover	15.9	10.7	35.0	11.3	10.3	10.4	44.4	9.4	10.1	7.7	5.2	26.5	17.4	18.4
90% turnover	14.4	9.1	35.3	10.2	8.8	9.6	43.4	8.4	9.1	6.4	4.8	25.3	16.8	17.6
100% turnover	13.4	8.0	35.4	9.5	7.8	9.2	42.8	7.7	8.3	5.6	4.6	24.5	16.4	17.1
25th percentile (i.e., 4% turnover)	7.0	4.5	25.9	8.1	3.6	5.3	38.7	6.0	7.2	4.1	3.5	21.0	16.1	13.3
50th percentile (i.e., 8% turnover)	7.4	4.5	25.9	8.2	3.6	5.4	38.8	6.0	7.4	4.2	3.5	21.0	16.1	13.5
75th percentile (i.e., 37% turnover)	11.3	6.1	28.0	9.5	4.9	6.1	40.7	7.0	9.0	5.8	3.9	22.6	16.7	16.0

Notes: [a]Quality measures are as follows: 1 = Help with daily activities increased, 2 = Moderate to severe pain, 3 = High-risk residents with pressure sores, 4 = Low-risk residents with pressure sores, 5 = Physical restraint use, 6 = More depressed or anxious, 7 = Low-risk residents with loss of bladder or bowel control, 8 = Had a catheter inserted and left in bladder, 9 = Spend most of the time in bed or in a chair, 10 = Ability to move in/around room got worse, 11 = With urinary tract infection, 12 = With delirium (short stay), 13 = With moderate to severe pain (short stay), 14 = With pressure sores (short stay).

[b]As an example, a facility with 10% nurse aide turnover was predicted to have 10% of residents whose help with daily activities had increased (i.e., Quality Measure 1), whereas a facility with 100% nurse aide turnover was predicted to have 14.5% of residents whose help with daily activities had increased (holding all other factors at their mean levels).

turnover increased from the 25th percentile to the 75th percentile, the predicted percentage of residents more depressed or anxious declined slightly from 5.8% to 5.5%.

Discussion

Nursing homes already employ more workers than steel producers and automakers combined (Eaton, 2000). Yet Silvestri (1993) projected a need for an additional 600,000 NAs during this decade. To meet this need for NAs, retention of current workers and recruitment from the labor pool is needed. Given that the pay for NAs is generally lower than that for fast-food workers, this represents a considerable challenge. However, probably the most important consequence of staff turnover is its potential influence on quality of care.

From our literature review, we determined that it is not clear whether staff turnover influences quality of care. We believe the results of prior studies examining this issue are equivocal because (a) they had limited power; (b) in all cases, linear measures of turnover were used; and (c) the definitions of turnover used were subject to a considerable degree of measurement error. Thus, we examined turnover using a large sample size, a noncontinuous functional form, and a validated measure of turnover.

Our results show that high staff turnover is associated with worse quality. This holds true for the quality factor score and for all of the 14 quality measures. This also holds true for NAs, LPNs, and RNs. Thus, we found some support for the hypothesis that high levels of turnover are associated with poor quality. However, this result does depend somewhat on what ''high'' level of staff turnover is

examined. Our data show that there are some limits to the higher turnover–poor quality relationship. It would seem that at 60% RN turnover, 60% LPN turnover, and 80% NA turnover, these relationships flatten (or even decline slightly), such that further turnover does not further worsen quality.

This latter finding shows that the relationship between staff turnover and quality is not linear. We speculated that this possible nonlinearity would be most pronounced at low levels of turnover. Specifically, we hypothesized that at very low levels of turnover, additional turnover would actually improve quality. We found this to be the case for RN turnover, with the quality factor scores improving from 0% to 30% turnover; and for NA turnover, with the quality factor scores improving from 0% to 40% turnover. This was not the case for low LPN turnover (i.e., 0% to 50% turnover). Nevertheless, despite these significant findings for both RNs and NAs, we should acknowledge that the magnitude of change in quality factor scores was low, and the practical significance of these changes in quality is likely minimal (as shown in Table 6).

Indeed, Table 6 indicates that, for the most part, the changes in the individual quality measures associated with turnover are modest. Nevertheless, turnover does seem to influence almost all of the quality measures, and, when viewed cumulatively, quite large improvements in quality result from lower rates of turnover.

Most studies identified in our literature review did not find a statistically significant association between staff turnover and quality. Studies with significant findings examined overall turnover of staff (Harrington & Swan, 2003) or RN turnover (Halbur & Fears, 1986; Spector & Takada, 1991). Surprisingly, no prior research has found a significant association between NA turnover and quality or LPN turnover and quality. Thus, our results are distinctive in showing some statistically significant associations between NA and LPN staff turnover and some quality measures.

Our results do mirror other studies in other ways, however. For example, Harrington and Swan (2003) identified an association between high staffing levels and more favorable resident outcomes. Our results, for NAs and RNs at least, were also robust in showing similar associations. We note, however, that the turnover–staffing relationship is deserving of more attention. Both staffing levels and turnover influence resident outcomes; thus, for a facility wishing to improve quality of care, a potential trade-off exists between investments in reducing turnover or increasing staffing levels. Moreover, the relative influence of turnover and staffing levels would appear to vary depending on the staff type (i.e., RN, LPN, or NA), and, to complicate things further, there could be a spillover effect of staffing and turnover levels from one staff type to another. Thus, further research in this area is clearly warranted.

Limitations

The three levels of turnover used in our analyses (presented in Table 5) came from the piecewise linear regression analyses we conducted. That is, we presented estimates of the relationship between quality and turnover using indicator variables for turnover levels determined from the piecewise linear functional form. Such a step function estimated with indicator variables captures nonlinearity, but the ''jumps'' in quality at specific values of turnover can sometimes lead to incorrect inferences. It is clearly more realistic to use a functional form that requires a continuous relationship between turnover and quality. In spite of this shortcoming of the indicator variable specification, we used this approach in order to allow comparisons to previous findings in the literature (e.g., Castle & Engberg, 2005).

The quality measures used in this investigation are arguably more precise than those used in prior research (e.g., Castle & Engberg, 2005). Nevertheless, the quality measures only represent some dimensions of quality, and they are variable over time at the same facility. We recognize that other quality measures, including resident satisfaction and resident quality of life, could have been used for these analyses. We could also have used other data sources, including the Minimum Data Set itself. Nevertheless, the Minimum Data Set is not readily available, and some quality measures from this data source may have reliability issues (Schnelle et al., 2004).

Policy and Practice Implications

Our results have both policy implications and practice implications. First, regulators are constantly looking for signals of poor quality. These signals can be used for additional certification survey activities (e.g., special emphasis inspections). Second, educational activities could also be targeted to high turnover facilities to help improve quality. Third, corporate management and facility owners concerned with quality may manage staff turnover more carefully. Our results suggest that RN turnover levels of less than 30%, LPN turnover levels of less than 50%, and NA turnover levels of less than 40% would be most advantageous.

As we discussed previously, turnover influences all of the quality measures, and cumulatively large improvements in quality could result from lower rates of turnover. However, readers must view this result in the context of the cross-sectional data examined. Causality is not implied in our findings; thus, changes in the quality measures identified in Table 6 may not fully materialize for individual facilities that have changes in their levels of turnover.

It may even be possible to include staff turnover in the federal report card Nursing Home Compare, as we know from previous work that consumers are very interested in and concerned with this area of the

nursing home (Castle, 2003). That is, when searching for and selecting a nursing home, consumers are interested in staff turnover rates (Castle, 2003). However, with the exception of asking facilities directly, few sources of turnover information exist. Still, if this information were to be included in Nursing Home Compare, our results show that some consideration on how this information is presented is warranted. First, the association of turnover and quality appears not to be linear, so simply presenting turnover in the current Nursing Home Compare format of a bar chart may be misleading. Second, the association of turnover and quality is not the same for all types of nursing home staff, so the report card may need to include three measures, which could confuse consumers. Third, nursing homes with few staff of a particular type will have high turnover rates when any of these staff depart. Thus, as is the current practice with the quality measures, some lower bound for the denominator of staff turnover measures may need to be defined. Clearly, how to present turnover rates requires careful consideration.

Conclusion

In conclusion, it is clear that the turnover rate for nursing home staff is high. The 1-year turnover rates identified in this study were 59.4%, 37.0%, and 36.1% for NAs, LPNs, and RNs, respectively. These results add to a rather large body of research over the past 30 years also showing high rates of caregiver turnover. Most important, we also show that, in general, high rates of turnover are associated with worse quality of care.

References

Abelson, M. A., & Baysinger, B. D. (1984). Optimal and dysfunctional turnover: Toward an organizational level model. *Academy of Management Review, 9,* 331–341.

Akaike, H. (1981). Likelihood of a model and information criteria. *Journal of Econometrics, 16,* 3–14.

Alexander, J., Bloom, J., & Nuchols, B. A. (1994). Nursing turnover and hospital efficiency: An organization-level analysis. *Industrial Relations, 33,* 505–520.

Anderson, R. A., Issel, L., & McDaniel, R. (1997). Nursing staff turnover in nursing homes: A new look. *Public Administration Quarterly, 21*(1), 69–95.

Banaszak-Holl, J., & Hines, M. (1996). Factors associated with nursing home staff turnover. *The Gerontologist, 36,* 512–517.

Castle, N. G. (2003). Searching for and selecting a nursing facility. *Medical Care Research and Review, 60,* 223–247.

Castle, N. G. (2006). Measuring staff turnover in nursing homes. *The Gerontologist, 46,* 210–219.

Castle, N. G., & Engberg, J. (2005). Staff turnover and quality of care in nursing homes. *Medical Care, 43,* 616–626.

Castle, N. G., & Engberg, J. (2006). Organizational characteristics associated with staff turnover in nursing homes. *The Gerontologist, 46,* 62–73.

Caudill, M. E., & Patrick, M. (1991). Costing nurse turnover in nursing homes. *Nursing Management, 22*(11), 61–64.

Centers for Medicare & Medicaid Services. (2001). *Appropriateness of minimum nurse staffing ratios in nursing homes: Phase II final report.* Washington, DC: U.S. Government Printing Office.

Cohen-Mansfield, J. (1997). Turnover among nursing home staff: A review. *Nursing Management, 28*(5), 59–60,62, 64.

Dalton, D. R., & Tudor, W. D. (1979). Turnover turned over: An empirical assessment. *Academy of Management Review, 42,* 225–235.

Decker, F. H., Gruhn, P., Matthews-Martin, L., Dollard, K. J., Tucker, A. M., & Bizette, L. (2003). *Results of the 2002 AHCA Survey of Nursing Staff Vacancy and Turnover in Nursing Homes.* Washington, DC: American Health Care Association.

Eaton, S. C. (2000). Beyond 'unloving care': Linking human resource management and patient care quality in nursing homes. *International Journal of Human Resource Management, 3,* 591–616.

General Accounting Office. (2002). *Nursing homes: Public reporting of quality indicators has merit, but national implementation is premature.* Washington, DC: Author.

Halbur, R. T., & Fears, N. (1986). Nursing personnel turnover rates turned over: Potential positive effects on resident outcomes in nursing homes. *The Gerontologist, 26,* 70–76.

Harrington, C., O'Meara, J., Kitchener, M., Simon, L., & Schnelle, J. F. (2003). Designing a report card for nursing facilities: What information is needed and why. *The Gerontologist, 43*(Special Issue II), 47–57.

Harrington, C., & Swan, J. H. (2003). Nursing home staffing, turnover, and case mix. *Medical Care Research and Review, 60,* 366–392.

Harrington, C., Zimmerman, D., Karon, S. L., Robinson, J., & Beutel, P. (2000). Nursing home staffing and its relationship to deficiencies. *Journal of Gerontology: Social Sciences, 55B,* S278–S287.

Institute of Medicine. (2001). *Quality of care in nursing homes.* Washington, DC: National Academy Press.

Knapp, M., & Missiakoulis, S. (1983). Predicting turnover rates among the staff of English and Welsh old people's homes. *Social Science & Medicine, 17,* 29–36.

Mukamel, D. B., & Spector, W. D. (2003). Quality report cards and nursing home quality. *The Gerontologist, 43*(Special Issue II), 58–66.

Munroe, D. (1990). The influence of registered nurse staffing on the quality of nursing home care. *Research in Nursing and Health, 13,* 263–270.

North Carolina Division of Facility Services. (2000). *Results of a follow-up survey to states on wage supplements for Medicaid and other public funding to address aide recruitment and retention in long-term care settings.* Retrieved March 12, 2005, from http://facility-services.state.nc.us

Park, H. Y., Ofori-Dankwa, J., & Bishop, D. R. (1994). Organizational and environmental determinants of functional and dysfunctional turnover: Practical and research implications. *Human Relations, 47,* 353–366.

Parsons, S. K., Simmons, W. P., Penn, K., & Furlough, M. (2003). Determinants of satisfaction and turnover among nursing assistants. The results of a statewide survey. *Journal of Gerontological Nursing, 29*(3), 51–58.

Phillips, C. (1987). Staff turnover in nursing homes for the aged: A review and research proposal. *International Journal of Nursing Studies, 24*(1), 45–58.

Phillips, C., Spector, W. D., & Takada, A. (1988). Staff turnover as an indicator of quality of care in American and Australian long-term care facilities. *The Gerontologist, 28*(Special Issue), 80A.

Price, J. (1977). *The study of turnover.* Ames: Iowa State University Press.

Revans, R. W. (1964). *Standards for morale: Cause and effect in hospitals.* London: Oxford University Press.

Schnelle, J. F., Bates-Jensen, B. M., Levy-Storms, L., Grbic, V., Yoshii, J., Cadogan, M., et al. (2004). The Minimum Data Set prevalence of restraint quality indicator: Does it reflect differences in care? *The Gerontologist, 44,* 245–255.

Schwartz, A. (1974). Staff development and morale building in nursing homes. *The Gerontologist, 14,* 50–53.

Silvestri, G. T. (1993). The American work force, 1992–2005. *Monthly Labor Review, 116*(11), 58–86.

Spector, W., & Takada, H. A. (1991). Characteristics of nursing homes that affect resident outcomes. *Journal of Aging and Health, 3,* 427–454.

Staw, B. (1980). The consequences of turnover. *Journal of Occupational Behavior, 1,* 253–273.

Straker, J. (1999). *Reliability of OSCAR occupancy, census, and staff data: A comparison with the Ohio Department of Health annual survey of long-term care facilities* (Tech. Rep. Series 3-01). Oxford, OH: Miami University, Scripps Gerontology Center.

Straker, J. K., & Atchley, R. C. (1999). *Recruiting and retaining frontline workers in long-term care: Usual organizational practices in Ohio.* Oxford, OH: Miami University, Scripps Gerontology Center.

Weech-Maldonado, R., Neff, G., & Mor, V. (2003). The relationship between quality of care and financial performance in nursing homes. *Journal of Health Care Finance, 29*(3), 48–60.

Zimmerman, S., Gruber-Baldini, A. L., Hebel, J. R., Sloane, P. D., & Magaziner, J. (2002). Nursing home facility risk factors and hospitalization: Importance of registered nurse turnover, administration, and social factors. *Journal of the American Geriatrics Society, 50,* 1987–1995.

Received January 5, 2007
Accepted March 6, 2007
Decision Editor: William J. McAuley, PhD