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Restructuring in response to case mix reimbursement in nursing homes: A contingency approach

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Abstract

Background—Resident-based case mix reimbursement has become the dominant mechanism for publicly funded nursing home care. In 1998 skilled nursing facility reimbursement changed from cost-based to case mix adjusted payments under the Medicare Prospective Payment System for the costs of all skilled nursing facility care provided to Medicare recipients. In addition, as of 2004, 35 state Medicaid programs had implemented some form of case mix reimbursement.

Purpose—The purpose of the study is to determine if the implementation of Medicare and Medicaid case mix reimbursement increased the administrative burden on nursing homes, as evidenced by increased levels of nurses in administrative functions.

Methodology/Approach—The primary data for this study come from the Centers for Medicare and Medicaid Services Online Survey Certification and Reporting database from 1997 through 2004, a national nursing home database containing aggregated facility-level information, including staffing, organizational characteristics and resident conditions, on all Medicare/Medicaid certified nursing facilities in the country. We conducted multivariate regression analyses using a facility fixed-effects model to examine the effects of the implementation of Medicaid case mix reimbursement and Medicare Prospective Payment System on changes in the level of total administrative nurse staffing in nursing homes.

Findings—Both Medicaid case mix reimbursement and Medicare Prospective Payment System increased the level of administrative nurse staffing, on average by 5.5% and 4.0% respectively. However, lack of evidence for a substitution effect suggests that any decline in direct care staffing after the introduction of case mix reimbursement is not attributable to a shift from clinical nursing resources to administrative functions.

Practice Implications—Our findings indicate that the administrative burden posed by case mix reimbursement has resource implications for all freestanding facilities. At the margin, the increased administrative burden imposed by case mix may become a factor influencing a range of decisions, including resident admission and staff hiring.

Keywords

nursing homes; case mix reimbursement; nurse staffing

Resident-based case mix reimbursement has become the dominant mechanism for publicly funded nursing home care. In 1998, skilled nursing facility (SNF) reimbursement changed from cost-based to case mix adjusted payments under the Medicare Prospective Payment System (PPS) for the costs of all SNF care provided to Medicare recipients (Health Care Financing Administration, 1998). Medicare beneficiaries served under the SNF benefit are classified into 1 of 44 resource utilization groups (RUGs), and Medicare payments for services furnished from all sources are bundled into a single RUG payment received by the SNF. In addition, as of 2004, 35 state Medicaid programs had implemented some form of case mix reimbursement (Feng, Grabowski, Intrator, Zinn, & Mor, 2008). Although varying along several important dimensions, most systems classify residents into homogeneous categories based on resource utilization. Associated with each of these categories is a case mix index, which represents, at least relatively, the resources consumed by the average resident in the group (Fries et al., 1994). Although 26 states use the 44 group RUGS III system developed for the Medicare program, 9 states employ a different resident classification system (Feng et al., 2008). Other sources of variation across state Medicaid systems include payment levels, focus (resident vs. facility), and frequency of case mix adjustment.

Despite these operational differences, both federal and state case mix systems were designed to achieve similar objectives. The primary objective was to increase access for residents by eliminating disincentives that discourage nursing homes from admitting heavy care patients. Indeed, recent research suggests the adoption of case mix payment's increased access to care for higher acuity Medicaid residents (Feng, Grabowski, Intrator, & Mor, 2006).

A second objective behind the introduction of case mix reimbursement was to provide an incentive for nursing homes to reallocate resources, in particular clinical staffing, in ways that are more responsive to the needs of the residents they serve. However, evidence to date appears to run contrary to this intent. For example, several studies found a decline in professional (registered nurse [RN] and licensed practical nurse [LPN]) nurse staffing after Medicaid case mix (Grabowski, 2002) and Medicare PPS (Konetzka, Yi, Norton, & Kilpatrick, 2004; White, 2005) implementation, although concurrent nursing shortages in some markets complicate attribution solely to case mix reimbursement. With respect to the Medicare PPS studies, there appears to be a "dosage effect," with greater declines in staffing associated with higher proportions of Medicare residents in total facility census. Worsening of certain quality indicators for long-stay residents post-PPS has been attributed to a reduction in surveillance and preventive care, consistent with the reduction in professional staffing under PPS (Konetzka, Norton, Sloane, Kilpatrick, & Stearns, 2006). Other studies have found no proportional increase in nurse staffing after Medicaid case mix reimbursement adoption (Butler & Schlenker, 1989; Cohen & Dubay, 1990). There was concern that case mix reimbursement could create disincentives to provide rehabilitation services to keep residents in a higher reimbursement category based on acuity (Rosko, Broyles, & Aaronson, 1987). A decrease in rehabilitation services attributed to a decline in physical therapy staff was found in two studies (White, 2003; Woodchis, 2004). In addition to reductions in staffing levels, nursing homes were more likely to hire staff than contract for physical therapy services post-PPS (Zinn et al., 2003).

Thus, although case mix reimbursement appears to have encouraged facilities to admit higher acuity residents, it also appears to have had the paradoxical effect of providing an

incentive to reduce staffing levels. One rationale provided for the decline in professional staffing after Medicare PPS implementation is that payment reductions in the years following PPS may have impeded the ability of nursing homes to be wage competitive (Konetzka et al., 2006). Salary differentials between nursing homes and hospitals competing for a limited pool of nurses may have been exacerbated, making it more difficult for nursing homes to hire and retain staff.

Although facility revenue losses resulting from case mix implementation may well have had clinical staffing implications, there are also associated administrative costs that could promote an increased investment in administrative functions. Accurate, timely charting is key to maximizing reimbursement under a case mix system. Assessments completed outside the mandated time frame can result in residents being dropped to the lowest RUGS III reimbursement category, with each instance amounting to thousands of dollars per month in lost revenue. In light of the financial consequences, although federal Medicare regulation only requires that assessments be coordinated by an RN, many facilities designate a full-time specialist to this activity (e.g., a nurse assessment coordinator) who is primarily responsible for coordinating and submitting timely assessments (Knapp, 1999; Nichols & Willis, 2004; Peck, 2001). Although the costs associated with the regulatory requirements and financial imperatives of the assessment process are directly attributable to case mix reimbursement, additional indirect administrative costs are also borne by the facility. For example, directors of nursing (DONs) assumed more managerial control, particularly with respect to budget and staffing issues post-PPS implementation (Peck, 2000). DONs may assume a supervisory role to ensure that communication systems are in place and functioning appropriately because the assessment nurses may lack the authority to access needed information (Shephard, 2003).

The purpose of this article is to determine if the implementation of case mix reimbursement for both Medicare and Medicaid increased the administrative burden on nursing homes, as evidenced by an increase in the level of nursing staff engaged in administrative functions. This question is important for several reasons. First, an early concern regarding the implementation of Medicare's Resident Assessment Instrument/Minimum Data Set (MDS) was that its administrative requirements took nurses away from clinical care (Nichols & Willis, 2004). In addition, if the additional administrative costs associated with case mix reimbursement are not recognized and compensated by payers, facilities may respond by shifting nursing resources away from clinical services. Indeed, the decline in professional nursing after case mix introduction suggests that hiring priorities may have shifted. Finally, the Centers for Medicare and Medicaid Services (CMS) is preparing to launch a new version of the MDS, the MDS 3.0, as early as Fall 2009 (<http://myziva.info/archive.php?k=25&keyword=&limit=25&spplace=&sprange=&daterange=&sortby=>). A better understanding of how the current system has already influenced staffing allocation decisions could inform behavioral assumptions underlying the MDS 3.0.

Conceptual Framework and Hypotheses

The contingency theory of organization (Lawrence & Lorsch, 1967) views organizations as rational entities capable and willing to make internal changes to achieve a technical fit between environment and structure. As the environment changes, the structure of the organization undergoes change to meet the new environmental conditions and avert a decline in performance. Contingency theory views effective organizations as those having structures that both support the unique nature of their production process and that are customized to complement their environment.

Although the contingency theory literature discusses a number of environmental factors that influence organization structure, one of the most studied is uncertainty in the operating environment (Begun & Kaissi, 2004; Young, Parker, & Charns, 2001). Higher levels of environmental uncertainty require organizational accommodation that expands information processing capabilities. The shift to case mix methodologies by both federal and state payers significantly increased the degree of uncertainty in the nursing home environment, particularly with respect to the predictability of reimbursement levels. Under cost-based reimbursement, revenues were generally determined by the volume of services provided. With most facilities historically running at close to full capacity, revenues were relatively stable and predictable. Under case mix reimbursement, revenues are determined by both volume and the characteristics of the residents generating that volume, making them less predictable and increasing uncertainty. Thus, we would expect nursing homes to respond by modifying structure (in this case by redefining roles and responsibilities) to improve information processing capabilities and achieve a better fit with the requirements of the changed environment. From a contingency perspective, employment of nurses in specific administrative tasks in response to case mix reimbursement represents structural change in the form of increased specialization. This expected response provides the rationale for our first two hypotheses:

- Hypothesis 1** The implementation of Medicaid case mix reimbursement for nursing homes is associated with higher levels of administrative nurse staffing.
- Hypothesis 2** Administrative nurse staffing levels in nursing homes increased disproportionately from linear patterns after the introduction of Medicare's PPS for SNFs.

In addition, based on the results of prior studies (Konetzka et al., 2004, 2006), we would expect a dosage effect with respect to the number of Medicare and Medicaid beneficiaries residing in a facility. Because increased resident volume translates into a higher assessment workload, we would expect an increase in the level of administrative nurse staffing. Hence,

- Hypothesis 3** Facilities with higher proportions of Medicaid residents in total census will have higher levels of administrative nurse staffing after the introduction of Medicaid case mix reimbursement.
- Hypothesis 4** Facilities with higher proportions of Medicare residents in total census will have higher levels of administrative nurse staffing after the introduction of PPS for SNFs.

There are two mechanisms by which nursing homes can increase the level of administrative nursing to achieve a better fit with the changed reimbursement environment. The first is to hire (or contract for) additional nurses for this specific purpose. If nursing shortages in the local market or resource constraints preclude this option, the alternative is to reassign existing nurses from clinical to administrative duties. Either option represents potential substitution between clinical and administrative nursing resources. The following hypothesis explores whether there is a trade-off between administrative and clinical nursing in nursing homes:

- Hypothesis 5** Facilities with lower levels of clinical nurse staffing will have higher levels of administrative nurse staffing.

An organization's existing capacity for securing or internally reassigning resources will impact on the ability to restructure in response to environmental change. Slack is defined as a pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output (Nohria & Gulati, 1996). Among the organizational characteristics associated with slack are control status, chain affiliation, and size. For-profit facilities presumably are the most market-oriented providers and, all other things being

equal, may be quicker to recognize the need to increase administrative nurse staffing. System membership (chain affiliation) may signify greater resource availability providing flexibility in responding to the needs of a changing environment and facilitating increases in administrative nurse staffing. Similarly, larger facilities command greater internal resources, which may include the availability of additional staff able to focus on administrative functions and may also be more capable of internal restructuring than are smaller facilities. Thus, we expect that for-profit, chain-affiliated, and larger facilities will be more responsive (or better able to adapt) to external policy changes by a greater increase in the level of administrative nurse staffing.

- Hypothesis 6** For-profit nursing homes will have higher levels of administrative nurse staffing after the introduction of federal- and state-level case mix reimbursement.
- Hypothesis 7** Nursing homes that are chain affiliated will have higher levels of administrative nurse staffing after the introduction of federal- and state-level case mix reimbursement.
- Hypothesis 8** Larger nursing homes will have higher levels of administrative nurse staffing after the introduction of federal- and state-level case mix reimbursement.

Methods

Data Sources and Sample Characteristics

The primary data for this study come from the CMS Online Survey Certification and Reporting (OSCAR) database from 1997 through 2004. We did not analyze OSCAR data from earlier years because information on administrative nurse staffing, our primary interest in this analysis, was not complete in the OSCAR system until 1997. The OSCAR is a national nursing home database containing aggregated facility-level information, including staffing, organizational characteristics, and resident conditions, on all Medicare-/Medicaid-certified nursing facilities in the country. The OSCAR data are self-reported by each facility during periodic inspections by the state (under contract with CMS), which occur on average approximately once a year. Survey results are evaluated to determine whether a Medicare-/Medicaid-participating nursing home meets the minimum quality and performance standards established by the CMS.

We tracked each facility over the study period and created a longitudinal data file with repeated annual observations (surveys) per facility. Excluded from our analysis were hospital-based facilities, which primarily serve short-stay postacute Medicare patients. These facilities tend to operate quite differently from free-standing nursing homes, often sharing staffing and resources with the affiliated hospital. Nursing homes located in rural areas were also excluded because they have different staffing patterns than urban facilities, reflecting differences in the structure of rural long-term care services and labor markets. Lastly, we dropped the small number of facilities located in Alaska, Hawaii, the District of Columbia, and other U.S. territories.

Information on state Medicaid payment policies through 1998, including case mix reimbursement and average daily payment rates, was obtained from a series of data books compiled by Harrington et al., (1999) and Swan et al. (2000). The parallel data for the most recent years from 1999 to 2004 were collected by the authors through a recent survey of state Medicaid offices, as described elsewhere (Grabowski, 2004). Relevant time-varying characteristics of the local nursing home market (as described later) were obtained from the county-level Area Resource File. After applying a standard set of data-cleaning rules to the

OSCAR data, we merged the longitudinal OSCAR file with Area Resource File and annual state Medicaid payment rates and case mix reimbursement information. As a result, the final analytic sample includes 68,672 observations (annual surveys) from 9,817 urban freestanding nursing homes in the 48 contiguous U.S. states covering the 8-year period from 1997 to 2004.

Measures

Administrative nurse staffing levels—The dependent variable is measured as the natural log of the total number of administrative nurse hours per patient day. The log form was used to smooth its skewed distribution. Administrative nurses were measured as the sum of two OSCAR variables: nurses with administrative duties and DON, defined in the OSCAR data as follows:

- Nurses with administrative duties: “Nurses (RN, LPN/LVN) who, as either a facility employee or contractor, perform the Resident Assessment Instrument function in the facility and do not perform direct care functions. Also include other nurses whose principal duties are spent conducting administrative functions. For example, the Assistant Director of Nursing is conducting education/in-service, or other duties which are not considered to be direct care giving. Facilities with an RN waiver who do not have an RN as DON report all administrative nursing hours in this category.”
- Director of nursing: “Professional registered nurse(s) administratively responsible for managing and supervising nursing services within the facility. Do not additionally reflect these hours in any other category.”

Facilities that reported zero administrative nurse hours (less than 0.5% of total observations) or greater than 3 hours per resident day (the 99th percentile) were treated as outliers (potentially due to reporting errors) and trimmed from the final analytic sample.

Case mix reimbursement effects—The effects of the introduction of Medicaid case mix reimbursement and Medicare PPS were tested using two dichotomous variables assigned a value of 1 to signify the year or date when case mix was introduced at the state and federal level, respectively (Hypotheses 1 and 2). The year of Medicaid case mix implementation varied across the states. During 1997–2004, 10 states newly adopted Medicaid case mix reimbursement, including Colorado (2000), Georgia (2002), Idaho (2000), Indiana (1999), Iowa (2001), Louisiana (2003), New Hampshire (1999), North Carolina (2004), Utah (2003), and Washington (1999). In the case of the federal Medicare PPS, the effective date was July 1, 1998. To test the dosage effect (Hypotheses 3 and 4), these dichotomous variables were interacted with the percentage of Medicaid and Medicare beneficiaries residing in the facility, respectively.

Substitution effects—Two variables are used to test the relationship between clinical and administrative nursing (Hypothesis 5): total clinical (RN and LPN) hours per resident day and a dichotomous variable assigned the value of 1 if the facility employs a nurse practitioner or physician assistant (NP/PA).

Organizational characteristics—Because control status, chain affiliation, and size are relatively invariant over time, we could not test their independent effects on administrative nurse staffing levels by including them in a facility fixed-effect model, which identifies only time-varying covariates. Instead, we included the interaction between control status (for-profit vs. nonprofit), chain affiliation (yes vs. no), and bed size (less than 100, 100–199, and over 200 beds), with the dichotomous variables representing Medicaid and Medicare case

mix implementation, to determine if the effects of case mix reimbursement vary by these organizational characteristics. Three separate models, each featuring one of these organizational characteristics and which interacted with Medicaid and Medicare case mix implementation, were estimated to test Hypotheses 6, 7, and 8, respectively.

Control variables—Additional market and organizational variables that could influence the level of administrative nursing in nursing homes were included as controls. Market-level variables control for differences in local supply and demand conditions. In highly competitive environments, organizations face greater uncertainty with respect to the ability to secure and manage inputs, in this case, resident case mix. Thus, we would expect levels of administrative nursing to be higher in facilities located in more competitive markets. We included two variables measuring market competition. The first is the Herfindahl index, which measures the extent of nursing home bed concentration in the local market. Ranging from 0 to 1, higher scores indicate higher concentration and hence less competition. The second is the average number of empty beds per nursing home in the market, a measure of excess capacity. Both variables were computed by aggregating facility data from OSCAR to the county level.

Prior studies have demonstrated a relationship between levels of clinical nurse staffing and state Medicaid rates (Cohen & Spector, 1996; Grabowski, 2001a, 2001b, 2004; Harrington, Swan, & Carrillo, 2007; Feng et al., 2006). As this relationship may also hold for administrative staffing, we include in the analytical models average state Medicaid payment rates, which were inflation adjusted (in constant 2004 dollars) using the annual consumer price index. To control for differences in supply that could affect the ability to hire and retain administrative nurses, the ratio of RNs and LPNs to hospital beds and the number of nursing home beds per 1,000 population over 65 were also included.

As the market presence of managed care increases, securing managed care contracts as a source of patient referrals becomes important. However, similar with case mix reimbursement, managing contracts imposes additional administrative costs. For that reason, we include managed care market penetration in the models. We expect that administrative nurse staffing levels will be higher in markets with higher managed care penetration. Per capita income was included in the models to control for differences in demand conditions across markets, and the area wage index was included to account for regional differences in the purchasing power of Medicaid payments and the price of medical and nursing services in nursing homes.

Documentation requirements may be higher in facilities caring for more medically complex residents. At the facility level, we included an acuity index derived from OSCAR which combines a range of activity of daily living dependencies and special treatment measures for all residents in a facility. This index controls for differences in case mix that could influence staffing levels independent of the use of case mix reimbursement methodology at the state and federal level. Finally, to control for other secular effects, a dummy variable was included for every year represented in the data (with 1997 as the base period). All continuous variables were centered at their aggregate mean over the study period, with an appropriate increment that is meaningfully interpretable (e.g., increase by \$10 or 1 standard deviation from the mean, etc.). A description of all variables included in the analysis is provided in Table 1.

Statistical Analysis

Taking advantage of the panel nature of our analytic file, we conducted multivariate regression analyses using a facility fixed-effects model (also termed a differences-in-differences model) to examine the effects of the implementation of Medicaid case mix

reimbursement and Medicare PPS on changes in the level of total administrative nurse staffing in nursing homes. The fixed-effects control for any fixed-facility-specific omitted variables that are correlated with the facility's propensity to increase or decrease administrative nurse staff hours. In addition, we included a dummy variable for each calendar year, which controls for unobserved national trends in administrative nurse staffing levels due to factors other than those considered in our model. Thus, this modeling approach implicitly purges unobserved and potentially confounded cross-sectional heterogeneity by relying on the within-facility variation in the covariates over time and by using facilities that did not experience a change in the covariates as a control for unrelated time series variation (Grabowski, 2002). Because facilities did not cross state boundaries, the facility fixed-effects model automatically identifies within-state variations in Medicaid payment rates and reimbursement policies, while providing more rigorous estimates of the effects of interest than would be the case if an alternative state fixed-effects model is specified whereby each state, instead of the facility, is treated as the panel.

We carried out the facility fixed-effects model using the XTREG procedure (using the within-panel estimator) available in version V9 of Stata software, which fits regression models to panel data. Because the dependent variable takes on the natural logged form, the estimated coefficient of an independent variable can be interpreted as the percent change in total administrative nurse hours per resident day in response to a one-unit increase in the independent variable. In addition, we applied the Huber/White/sandwich robust variance estimator, combined with clustering on the panel variable (facility), to produce standard errors of the parameter estimates that are robust to cross-sectional heteroskedasticity and within-panel serial correlation.

Findings

Descriptive statistics aggregated over all years in this analysis for the independent and control variables, including their means and standard deviations (if continuous) or percentages (if categorical), are provided in Table 1. We ran the correlation matrix (not reported but available upon request) for covariates included in the model and did not see any indications of even moderate collinearity between the covariates that might compromise our results.

Table 2 presents the results from the facility fixed-effects models estimating the level of administrative nurse staffing in nursing homes.

Model 1 includes main effects of the covariates and the interaction terms measuring dosage effects. As indicated in Model 1, both the introduction of Medicaid case mix reimbursement and Medicare PPS increased the level of administrative nurse staffing in nursing homes by, on average, 5.5% and 4.0%, respectively (Hypotheses 1 and 2). Thus, after controlling for overall time trends (calendar year effects), the introduction of Medicare PPS appears to have almost as strong an effect on the use of administrative nurses as does the implementation of state-based case mix reimbursement. This increase in administrative nurses corresponds to the mandatory submission of computerized MDS data to the state in the summer of 1998.

However, as indicated by the two interaction terms in Model 1, the dosage effect was only observed with respect to Medicaid case mix reimbursement. Levels of administrative nurse staffing increased with the proportion of Medicaid recipients in the total resident census after the introduction of Medicaid case mix reimbursement but were not observed with respect to Medicare residents post-PPS (Hypotheses 3 and 4).

Hypothesis 5 addressed the potential for substitution between direct care and administrative nursing in nursing homes. However, rather than decreasing, the level of administrative nurse

staffing increases with the level of direct care staffing and in nursing homes that employ an NP/PA, suggesting that these two types of staffing are complements rather than substitutes. Specifically, an increase in total direct care professional nurse staffing by 0.5 hour per resident day is associated with an approximately 12% increase in total administrative nurse hours per resident day. The employment of an NP/PA would increase total administrative nurse staffing levels by roughly 3%.

Models 2 through 4 test whether case mix reimbursement effects on administrative staffing levels vary by organizational characteristics. Results suggest that the effect of Medicaid case mix reimbursement does not vary by control status (Model 2), chain affiliation (Model 3), or size (Model 4). The effect of Medicare PPS also does not vary by control status or chain affiliation, but it does vary by size: the medium-sized (in the 100–199 bed range) and large-sized facilities with over 200 beds were significantly more likely to increase administrative nurse staffing in response to the introduction of Medicare PPS, relative to small facilities (under 100 beds).

The findings with respect to some of the control variables are worth noting. Across the models, results clearly indicate a strong upward time trend in administrative nurse staffing levels in all types of facilities over the study period, net of the effects of state policies, and other factors included in the models. With respect to competition, a larger average number of empty beds per facility in the local market, signifying greater excess capacity and hence greater competition, were associated with higher levels of administrative nurse staffing. Higher values of the Herfindahl index, signifying less competition, were associated with lower levels of administrative nurse staffing in nursing homes, although this effect was not significant at $p < .05$. As expected, facilities located in markets with higher levels of managed care market penetration have higher levels of administrative nurse staffing. Finally, there was no significant relationship between the nursing home's acuity index and the level of administrative nurse staffing.

Discussion

Like other major changes in nursing home policy at the federal and state level (Zhang & Grabowski, 2004), the introduction of case mix reimbursement was associated with changes in nursing home staffing. Although prior studies found that nursing home case mix reimbursement resulted in a decrease in direct care professional staff (Feng et al., 2008; Konetzka et al., 2004, 2006; White, 2003, 2005), ours is the first to demonstrate an increase in administrative nurse staffing in response to its introduction. This finding is consistent with the predictions of contingency theory. Case mix reimbursement increased environmental uncertainty with respect to revenue flows, requiring better information processing capabilities and more control over the assessment process to prevent a decline in financial performance. This has prompted restructuring of the roles and responsibilities of professional nurse staff with increasing specialization in assessment and monitoring functions. The importance of control over these functions is further evidenced by how few facilities contract out for administrative nurse services. On average, over the years represented in our database, over 98% of facilities maximized control over administrative nurse services by using hired staff exclusively for these functions. By contrast, 23% of nursing homes contract for at least some direct resident care nursing services (Bourbonniere et al., 2006).

Clinical nurse staffing levels were associated with higher levels of administrative nurse staffing, suggesting that these are complements rather than substitutes. If, as prior studies suggest, there was a decline in direct care staffing after the introduction of case mix reimbursement, our results imply that this is not attributable to a shift in nursing resources to

administrative functions. The administrative burden posed by the introduction of case mix reimbursement does not appear to be associated with a decline in direct resident care hours.

We anticipated finding a dosage effect attributable in part to the greater volume of assessments generated by higher proportions of public payer beneficiaries in total resident census. Although the proportion of Medicare, but not Medicaid residents in total census, was independently associated with higher administrative nurse staffing levels, the dosage effect was observed only with respect to Medicaid census. Although the effect of introducing case mix reimbursement does not differ by the proportion of Medicare residents in the facility, it does by the proportion of Medicaid residents. Although there is some variation in Medicare census across facilities, the absolute level is relatively low in freestanding nursing homes (on average 10%) compared with the Medicaid and private-pay resident census. Thus, the additional administrative burden posed by Medicare PPS may represent a relatively fixed cost that does not vary across the typical Medicare volume ranges in nursing homes. On the other hand, the volume of Medicaid recipients varies considerably across freestanding nursing homes. For example, 25% of nursing homes have less than 54% Medicaid residents in total census, whereas 25% have over 80%. Thus, the administrative burden imposed by Medicaid case mix reimbursement is more likely to vary proportionately to volume. From a policy perspective, this implies that there is a disproportionate administrative burden imposed by case mix in high Medicaid volume facilities.

Our results point out differences in response to case mix payment attributable to size. Medium and large facilities, relative to small facilities, significantly increased administrative nurse staffing levels after Medicare PPS introduction. It was anticipated that slack resources available to larger facilities would allow them to increase administrative staffing in response to federal and state case mix reimbursement requirements. However, both medium and large facilities were characterized by this response with respect to PPS, but not to the introduction of state case mix reimbursement. It may be that the relatively low Medicare census typically found in most small freestanding facilities obviates the need to increase staffing to meet administrative requirements. Alternatively, small facilities may lack the resources to either hire or reassign staff to these functions, which could place them at a relative disadvantage.

We expected that more market-oriented nursing homes would be more likely to identify changes in the operating environment requiring structural adaptation. We found no evidence, however, to support this hypothesis as our results indicated no difference in response to case mix reimbursement introduction attributable to either for-profit status or chain affiliation. The introduction of a new reimbursement methodology represents a regulatory change impacting on all nursing homes rather than discretionary market opportunity like managed care participation. As such, response may not depend on strategic orientation but rather on having the means to do so.

The results of some of the control variables merit comment. From a contingency perspective, competition adds to the uncertainty of the operating environment, in this case, with respect to resident admissions. Our results confirm that nursing homes in more competitive environments (those characterized by excess capacity) would respond to this uncertainty by increasing administrative nurse staffing. Contracting with managed care organizations imposes administrative demands independent of case mix reimbursement and was consistently associated with administrative nurse staffing levels in all models. Finally, the lack of association with the facility acuity mix suggests that the level of administrative nurse staffing is more responsive to the demands of the reimbursement methodology than to the documentation required for medically complex residents.

Practice Implications

Our findings indicate that the administrative burden posed by case mix reimbursement has resource and consequently managerial decision-making implications for all freestanding facilities. A 5.5% increase (effect of state Medicaid case mix reimbursement) above the sample mean of 0.24 total administrative nurse hours per resident day would translate into a net increase of roughly 0.3 full-time equivalent (FTE) administrative nurses per 100 residents. Similarly, a 4.0% increase in staffing due to the implementation of Medicare PPS would translate into an additional increase of roughly 0.2 FTE administrative nurses per 100 residents. The combined effects of both Medicaid and Medicare case mix reimbursement amount to nearly a 10% increase in total administrative nurse hours per resident per day or an increase of 0.5 FTE administrative nurses. Considering the substantial direct and indirect costs to the facility for paying for these additional nurses, an increase in staffing of this magnitude is not trivial. Almost all administrative nurses will be RNs, with a minimum salary of \$50,000 year. Factoring in fringe benefits (30%), the additional 0.5 FTE administrative nurse would cost, on average, at least \$33,000 annually and perhaps as much as \$50,000 for a home with 100 residents.

Limitations

In a recent article, Kash, Hawes, and Phillips (2007) compared RN, LPN, and nurse aide staffing levels in Texas nursing homes as documented in OSCAR and Medicaid cost report data. Average staffing levels were found to be higher in the OSCAR data than in the cost report data. Although the study was confined to a single state and did not consider administrative nurses as reported in the OSCAR, it raises concerns about the accuracy of the OSCAR staffing data. However, because we use a fixed-effect model, there is no reason to expect that the size or direction of the measurement error would change within state over time.

In addition, although we assert that limiting our sample to urban freestanding facilities is justified by differences in the market circumstances faced by rural nursing homes, our results are not generalizable to these facilities. Finally, despite potential endogeneity concerns that may reduce the observed effect of case mix reimbursement introduction on administrative nurse staffing, the acuity index was retained in the model because some facilities had large increases in acuity over the years, independent of the introduction of case mix reimbursement.

Conclusion

In conclusion, our findings have implications for both policy makers and managers. From a policy perspective, our results demonstrate that, although case mix payment is associated with certain benefits (e.g., access to care for higher acuity Medicaid residents), it also imposes additional administrative costs on facilities in the form of increased administrative nurse staffing. If case mix systems do not compensate homes for these additional costs (and it is our understanding that they generally do not), then this may eventually impact the ability of the homes to deliver quality care. The dosage effect suggests that this cost burden may be disproportionately higher in high Medicaid volume facilities. Case mix introduction also has implications for managerial decision making with respect to resource allocation in nursing homes. At the margin, the increased administrative burden imposed by case mix reimbursement may become a factor influencing a range of decisions, including resident admission and staff hiring. However, increased administrative nurse staffing has become an unavoidable cost of doing business in market segments that most of the homes can ill afford to lose. Future research can guide facilities in how to organize these functions to deliver

resident care effectively, efficiently, and in a manner that promotes job satisfaction for the staff involved.

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Table 1

Description of variables included in the facility fixed-effects models (aggregated over 1997–2004, $N=68,672$)

	<i>M (SD)</i>	Coding in models
Dependent variable		
Total administrative nurse hours per resident day	0.24 (0.17)	Natural logged
Independent variables		
Hypotheses		
Medicaid case mix reimbursement (state)	64.6%	1/0
Medicare PPS (post July 1, 1998)	81.9%	1/0
% Medicaid (facility)	66.9 (20.4)	Centered at mean/10% increments
% Medicare (facility)	9.5 (9.6)	Centered at mean/10% increments
Total direct care RN + LPN HPRD (facility)	1.03 (0.55)	Centered at mean/0.5-hour increments
Employment of an NP/PA (facility)	23.9%	1/0
Controls		
CPI-adjusted Medicaid rate (state)	17.60 (\$24.05)	Centered at mean/0 increments
Herfindahl index (county)	0.26 (0.25)	Centered at mean/1 <i>SD</i> increments
Average no. of empty nursing home beds (county)	14 (10)	Centered at mean/10-bed increments
Ratio: RNs to hospital beds (county)	1.34 (0.53)	Centered at mean/1 <i>SD</i> increments
Ratio: LPNs to hospital beds (county)	0.22 (0.15)	Centered at mean/1 <i>SD</i> increments
No. of NH beds/1,000 65+ (county)	52 (23)	Centered at mean/10-bed increments
% MCO penetration (county)	10.8 (12.8)	Centered at mean/10% increments
Per capita income (county)	\$26438 (\$7679)	Centered at mean/\$1,000 increments
Area wage index (county)	0.96 (0.12)	Centered at mean/1 <i>SD</i> increments
Acuity index (facility)	11.0 (1.6)	Centered at mean/1 <i>SD</i> increments
Year		
1997 (reference)	12.2%	1/0
1998	11.8%	1/0
1999	12.0%	1/0
2000	12.4%	1/0
2001	12.7%	1/0
2002	13.1%	1/0
2003	13.1%	1/0
2004	12.8%	1/0

Note. *SD* = standard deviation; PPS = Prospective Payment System; RN = registered nurse; LPN = licensed practical nurse; HPRD = hours per resident day; CPI = consumer price index; NP/PA = nurse practitioner/physician assistant; MCO = managed care organization.

Table 2

Results of facility fixed-effects models estimating the effect of case mix reimbursement on administrative nurse staffing levels, 1997–2004

	Model 1	Model 2	Model 3	Model 4
Hypotheses				
Medicaid case mix reimbursement (state)	0.055 **	0.064 **	0.042 **	0.050 **
Medicare PPS (post July 1, 1998)	0.040 **	0.049 **	0.046 **	0.008
% Medicaid (facility)	−0.000	−0.000	−0.000	0.000
% Medicare (facility)	0.021 **	0.020 **	0.020 **	0.022 **
Case mix reimbursement: % Medicaid	0.007 *	0.008 *	0.007 *	0.007
Medicare PPS: % Medicare	−0.006	−0.005	−0.005	−0.007
Total direct care RN + LPN HPRD (facility)	0.120 **	0.120 **	0.120 **	0.119 **
Employment of an NP/PA (facility)	0.026 **	0.026 **	0.026 **	0.025 **
Case mix reimbursement: for-profit	—	−0.020	—	—
Medicare PPS: for-profit	—	−0.012	—	—
Case mix reimbursement: chain	—	—	0.021	—
Medicare PPS: chain	—	—	−0.010	—
Case mix reimbursement: medium size	—	—	—	0.005
Case mix reimbursement: large size	—	—	—	0.046
Medicare PPS: medium size	—	—	—	0.050 **
Medicare PPS: large size	—	—	—	0.064 **
Controls				
CPI-adjusted Medicaid rate (state)	0.003	0.004	0.003	0.004
Herfindahl index (county)	−0.068	−0.068	−0.068	−0.069
Average no. of empty NH beds (county)	0.040 **	0.040 **	0.040 **	0.040 **
Ratio: RNs to hospital beds (county)	0.001	0.001	0.001	0.001
Ratio: LPNs to hospital beds (county)	−0.015	−0.016	−0.016	−0.015
No. of NH beds/1,000 65+ (county)	−0.025 **	−0.025 **	−0.025 **	−0.025 **
% MCO penetration (county)	0.023 **	0.023 **	0.022 **	0.022 **
Per capita income (county)	−0.006 **	−0.006 **	−0.006 **	−0.006 **
Area wage index (county)	0.021	0.021	0.020	0.016
Acuity index (facility)	0.006	0.006	0.006	0.006
Year ^a				
1998	0.037 **	0.037 **	0.037 **	0.037 **
1999	0.064 **	0.064 **	0.064 **	0.064 **
2000	0.089 **	0.089 **	0.089 **	0.089 **
2001	0.116 **	0.116 **	0.115 **	0.115 **
2002	0.126 **	0.126 **	0.126 **	0.125 **
2003	0.117 **	0.117 **	0.116 **	0.116 **

	Model 1	Model 2	Model 3	Model 4
2004	0.119 **	0.119 **	0.119 **	0.118 **
Intercept	-1.828 **	-1.827 **	-1.826 **	-1.825 **
N of observations (surveys)	68,672	68,672	68,672	68,672
N of facilities	9,817	9,817	9,817	9,817
$R^2(v_1, v_2)$	76.23	70.69	70.57	66.37
$P > F$	0.000	0.000	0.000	0.000

Note. Outcome = total administrative nurse HPRD, natural logged. Numbers in table are β coefficient values. Robust standard errors were adjusted for clustering of surveys within facility. PPS = Prospective Payment System; RN = registered nurse; LPN = licensed practical nurse; HPRD = hours per resident day; NP/PA = nurse practitioner/physician assistant; CPI = consumer price index; MCO = managed care organization; NH = nursing home.

^aReference (baseline) year is 1997.

*
 $p < .05$.

**
 $p < .01$.