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Results of a Longitudinal Analysis of National Data to Examine Relationships Between Organizational and Market Characteristics and Changes in Antipsychotic Prescribing in US Nursing Homes From 1996 Through 2006

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Abstract

Objective—The aim of this work was to examine the association between organizational characteristics, market characteristics, and changes in antipsychotic medication use in US nursing homes over time.

Methods—This was a longitudinal study comparing antipsychotic use in US nursing homes from 1996 through 2006 using Medicare and Medicaid data (the Online Survey Certification And Reporting system) and US Department of Health and Human Resources Health Resources and Services Administration data (the Area Resource File). The 3 outcomes of interest were increasing, decreasing, or stable use of antipsychotic medications. The primary independent variables were organizational characteristics (e.g., for-profit status, chain membership) and market characteristics (e.g., Medicaid reimbursement, levels of competition).

Results—Antipsychotic use increased from 16.4% in 1996 to 25.9% in 2006 ($P < 0.05$). A multinomial generalized estimating equations model, controlling for facility, staffing, and resident factors, suggested that increased antipsychotic use was associated with for-profit facilities (adjusted odds ratio [AOR], 1.58; 95% CI, 1.51–1.65; $P = 0.001$). Decreased antipsychotic use was associated with chain membership (AOR, 0.82; 95% CI, 0.79–0.85; $P = 0.001$), higher levels of

competition (AOR, 1.22; 95% CI, 1.16–1.29; $P = 0.001$), and a higher Medicaid reimbursement rate (AOR, 0.88; 95% CI, 0.85–0.92; $P = 0.001$).

Conclusion—Antipsychotic use is increasing in nursing homes and is associated with certain organizational facility characteristics and market factors. Future interventions to reduce antipsychotic use in nursing homes will have to be targeted toward these factors.

INTRODUCTION

Antipsychotic medications have been prescribed for decades to treat psychosis, aggression, and agitation in US nursing home residents.^{1–6} After the implementation of the Nursing Home Reform Act (NHRA), which states that residents have the right to be free from any psychotropic drug imposed for the purpose of discipline or convenience (included in the Omnibus Budget Reconciliation Act of 1987), antipsychotic use decreased to a facility average of 17% of residents.^{1–4} With the advent of newer atypical antipsychotics in the mid-1990s, cross-sectional studies using national nursing home data found that the rate of antipsychotic use has reached 24.8% to 27.6%.^{5–7}

Of concern is that this increased rate of antipsychotic prescribing may represent overuse, because emerging data suggest that these agents have limited efficacy for treating behavioral and psychological symptoms of nursing home residents.^{8–11} There is increasing evidence indicating that antipsychotic medications are associated with serious adverse drug events including falls, diabetes mellitus, cerebrovascular events, venous thromboembolism, and even mortality.^{11–16} Furthermore, this rise in antipsychotic use represents suboptimal prescribing (i.e., unnecessary and inappropriate drug use). Indeed, a study by Briesacher et al⁵ using national data from 2001 reported that only 41.8% of antipsychotic use was appropriate per NHRA guidelines.

More information is needed to better understand why antipsychotic prescribing in nursing homes has increased over time. The most recent studies from the United States are limited because of their cross-sectional designs and focus on patient characteristics associated with antipsychotic use.^{5–7} Rochon et al¹⁷ concluded, “[R]esults suggest that antipsychotic therapy is not being prescribed based on their clinical indication. Rather, the decision to prescribe an antipsychotic therapy appears to be related to the nursing home environment, with some environments being more permissive about their use.” Therefore, research is needed to examine the nursing home environment that may be associated with longitudinal changes in antipsychotic prescribing.^{17, 18} Environmental factors include organizational (e.g., for-profit status, chain membership) and market characteristics (e.g., Medicaid reimbursement, levels of competition), because these characteristics may influence the context of care.

Given this background, the objective of this national longitudinal study was to examine the association between organizational characteristics, market characteristics, and changes in antipsychotic medication use in US nursing homes between 1996 and 2006.

METHODS

Study Design, Sample, and Source of Data

A longitudinal panel study of residents admitted to nursing homes between 1996 and 2006 was used. The sample consisted of 15,155 US nursing homes in 1996 and 17,213 in 2006. Data used in this investigation came from the 1997 through 2007 Online Survey Certification And Reporting (OSCAR)¹⁹ system and the Area Resource File (ARF).²⁰

OSCAR data are collected by state licensure and certification agencies as part of the Medicare and Medicaid certification process, and include most facilities in the United States. That is, OSCAR represents ~96% of all nursing homes in the United States. Medicare and Medicaid certification occurs about once a year for each facility, with OSCAR data collected at each certification. Thus, as was done in this study, the data can be merged into a longitudinal panel format. There are ~300 data elements in OSCAR. Organizational characteristic data elements relevant to this study are staffing levels, chain membership, occupancy rate, and ownership characteristics. Resident characteristic data elements relevant to this study include the number of residents who are restrained or catheterized, have psychiatric problems, or are given psychotropic medications. OSCAR data are often used by researchers as a secondary source of nursing home characteristics,¹⁸ and are available to the public on the Centers for Medicare and Medicaid Services Web site.²¹ These data have been used by both state and federal governments to produce Web-based nursing home report cards, including the federal Nursing Home Compare report card initiative.

ARF represents a compilation of data sources such as the American Hospital Association annual hospital survey and the US Census of Population and Housing. These data are at the county level and are commonly used in health services research.¹⁸ Extensive details regarding the ARF can be found on the Centers for Disease Control and Prevention Web site.²⁰

State-level Medicaid reimbursement levels for the years 1996 through 1999 were obtained from data published by Harrington et al,²² and levels for 2000 through 2006 were gathered from primary data collected by the authors of the present study. This study was approved by the University of Pittsburgh's institutional review board.

Outcome Measure

The primary outcome measure was the use of anti-psychotic drugs taken from the OSCAR data set. This was an aggregate measure, representing the percentage of residents in each facility who received antipsychotic drugs during the 2 weeks before the OSCAR survey. Specifically, antipsychotic drug use change scores from 1996 through 2006 were used. For purposes of analyses, levels of drug use over the 11-year period were defined as follows: (1) increasing use, (2) stable use, or (3) decreasing use. These change scores were calculated on a yearly basis (eg, 1997 level minus 1996 level, 1998 level minus 1997 level). Increasing antipsychotic drug use was defined as a ≥1% increase from one year to the next, stable antipsychotic drug use was defined as a change between -1% and 1% from one year to the next, and decreasing antipsychotic drug use was defined as a ≥1% decrease from one year to the next.

This categorical approach to the data analysis was used because the distribution of antipsychotic drug use was highly skewed. Categorical variable use is recommended with highly skewed distributions, and using 3 categories is more efficient than the binary response.²³ Also, previous research reported that examining covariates for facilities with increased, stable, and decreased care processes may be productive.²⁴

Primary Independent Variables

Based on findings from previous studies, 2 organizational factors (ownership and chain membership) were considered as primary independent variables.^{5–7,17,18}

Specifically, 2 classes of facility ownership were examined: for-profit and not-for-profit. Likewise, 2 classes of chain membership were used: chain and nonchain. Also, based on previously published literature,^{17,18} 2 market factors (Medicaid reimbursement and competition) were included as primary independent variables. Medicaid reimbursement was defined as the average dollar amount paid by Medicaid per resident day. Competition was measured using the Herfindahl index.²⁵

This index is a measure of the competitiveness of the market in which a facility is located. The county was the market area used in this analysis, and the index is calculated by taking each nursing facility's percentage share of beds in the county and dividing by the squared market shares of all nursing homes in the county. The index ranges from 0 to 1, with 1 representing a monopoly market, and lower values in cases in which there are many homes (each of which holds a small share of the market). The index was calculated using nursing home beds, and therefore represents a measure of competition from nursing homes.

Control Variables

Because of previous relationships with antipsychotic drug use, facility, staffing, and resident factors were included as covariates within the analysis.^{5–7,17,18} Facility factors expressed as percentages and mean (SD) included bed size, Alzheimer's disease special care units, average occupancy, average Medicaid occupancy, and hospital-based long-term care services. We controlled for hospital-based facilities because we were concerned that these facilities may have skewed our data.²⁶ Six separate staffing factors were included. Three different types of nursing staff were included as part of staffing, the number (measured as full-time equivalents [FTEs]) of registered nurses, the number of licensed practical nurses, and the number of nurse's aides per resident. The hours spent on site by medical directors, physicians, and physician extenders were also included.

Resident factors known to be important in the investigation of quality were also included as controls.^{5–7,17,18,27} A continuous measure was included for the activities of daily living (ADL) score. The ADL score is a facility score (ranging from 0 to 1) based on 6 OSCAR questions (difficulty with bathing, dressing, toileting, transferring, feeding, or walking).²⁵ Increasing scores indicate a greater average ADL impairment within the facility. The numbers of residents with specific problems were used to calculate proportions with bladder incontinence, bowel incontinence, and any psychiatric diagnosis, mental retardation, or dementia. In addition, we controlled for physical restraint use because physical restraints may be substitutable with chemical restraints (eg, antipsychotics) in the nursing home

setting.²⁸ We also controlled for the average per capita income use of antianxiety, sedative/hypnotic, and antidepressant medications.²⁹

Statistical Methods

Descriptive statistics were used to summarize the data (i.e., percentages, means, and SD values). Differences between 1996 and 2006 control variables were tested using paired χ^2 and t tests. We used multivariable ordered multinomial logistic regression analyses for the categorical outcomes (increasing use, stable use, or decreasing use). Specifically, the GENMOD procedure was used so that data from each nursing home for each year were included in the analyses. The level of collinearity among the control variables was examined using the variance inflation factor test. This showed no problems of collinearity.

In the multivariate analyses, we used generalized estimating equations (GEEs). GEEs were used because biases can occur in data consisting of repeated observations. For all variables, observations in each year of data (i.e., 1996 through 2006) were used. The biases are the result of the potential correlation among the repeated observations. This can lead to elevated significance levels. GEEs control for the correlation caused by repeated observations and provides more robust significance levels.³⁰ The odds ratios of the outcome measures can be interpreted as the effect of the covariate on the odds of increasing antipsychotic drug use. SAS version 9.13 (SAS Institute Inc., Cary, North Carolina) was used for all statistical analyses.

RESULTS

Table I presents information about facility, staffing, and resident factors used as control variables in 1996 and 2006. In 1996, the mean nursing home size was 110 beds; in 2006, it was 109. Over the 11-year period, the proportion of nursing homes with Alzheimer's disease special care units increased from 14% to 18% and the proportion of nursing homes that were based in hospitals decreased from 11.5% to 9.7% (both comparisons, $P < 0.05$ between years).

During the study interval, the number of physician- extender FTEs increased slightly from 0.02 to 0.07 ($P < 0.05$). The rate of physical restraint use decreased from 15% to 10%, the rates of residents with psychiatric diagnoses increased from 12% to 16%, and the concurrent use of antidepressants increased from 22% to 47% (all comparisons, $P < 0.05$ between years).

Table II shows the primary independent variables of interest. These organizational and market factors were stable over the 11-year time period. Antipsychotic use from an average of 16.4% in 1996 to 25.9% in 2006 ($P < 0.05$).

Table III shows the results of the multivariable analyses for the relationship between the primary independent variables and change in antipsychotic use. Controlling for facility, staffing, and resident factors, for-profit facilities (compared with not-for-profit facilities) were more likely to increase antipsychotic drug use (adjusted odds ratio [AOR], 1.58; 95% CI, 1.51–1.65; $P = 0.001$). Members of chains (compared with independent facilities) were

less likely to increase the use of antipsychotic medications (AOR, 0.82; 95% CI, 0.79–0.85; $P = 0.001$). Examining the market factors of interest, higher levels of competition (AOR, 1.22; 95% CI, 1.16–1.29; $P = 0.001$), and a higher Medicaid reimbursement rate (AOR, 0.88; 95% CI, 0.85–0.92; $P = 0.001$) were associated with decreasing use of anti- psychotic medications.

DISCUSSION

The results of the present study suggest that antipsychotic use in nursing homes has increased by nearly 60% over an 11-year period. The 25.9% rate of antipsychotic use noted in 2006 was consistent with the rates found by other investigators using data from 2001 to 2004.^{5–7} It is particularly important to note that anti-psychotic use in 2006 was substantially higher than the 17% average seen after the implementation of the US NHRA.^{2–4} The substantial increase in antipsychotic use observed in the present study occurred despite the fact that the NHRA was still in effect.

Our study also suggests that certain organizational and market characteristics are associated with this acute rise in antipsychotic use in US nursing homes. Notably, we found that for-profit nursing homes were associated with increased antipsychotic use compared with non-profit facilities. These findings are consistent with those reported by Hughes ET al¹⁸ using 1997 OSCAR data. One possible explanation for the adverse association with for-profit ownership may be that antipsychotics could be prescribed more frequently to maximize profits by reducing the need for hands-on care.³¹ For example, antipsychotic medications may be less expensive than providing additional nursing staff or continuing education about how to handle residents with psychosis, aggression, or agitation.

The results of the present study also suggest that decreasing antipsychotic use was associated with chain membership, higher Medicaid reimbursement, and higher levels of market competition. A possible mechanism involved in decreasing antipsychotic medication use with chain membership may be a higher degree of corporate standardization and oversight. Grabowski²⁹ described the negative effects on nursing home care of low Medicaid reimbursement rates. Higher Medicaid reimbursement may provide resources for additional staffing or education and reduce the reliance on antipsychotic medications to cope with residents with psychosis, aggression, and agitation.³² The notion that competition is associated with quality is well established. For example, Castle ET al³³ found that nursing homes in the most competitive markets showed the greatest improvements in their quality measure scores.

Given these findings, it seems appropriate to ask what other approaches should be considered to reduce antipsychotic use in nursing homes, given that federal regulation has failed to maintain earlier reductions in antipsychotic use. A recent review of the literature identified several successful approaches that improved suboptimal psychotropic prescribing in older patients.³⁴ In a randomized controlled trial, one effective approach to reducing antipsychotic use was educating the facility's nurses and nursing assistants about nonpharmacologic treatment of behavioral symptoms of dementia.³⁵ In another trial, enhanced clinical pharmacy services that involved comprehensive medication review and

feed- back to nurses and physicians also reduced antipsychotic prescriptions.³⁶ An untested approach in nursing homes that was successful in the hospital setting was the use of computerized prescribing with decision support.³⁷

There are several potential limitations to this study. First, no causal findings are presented. We observed an increase in the use of antipsychotics in nursing homes, but the relationships presented with the organizational characteristics (i.e., for-profit status and chain membership) and market characteristics (i.e., Medicaid reimbursement and levels of competition) of interest are simply associations.

Second, the analyses in this study used a categorical approach to examine patterns of antipsychotic drug use. One limitation of this approach is that it is insensitive to the degree of increase in antipsychotic drug use. Differences may exist between facilities with large increases in antipsychotic drug use compared with those with smaller increases.

Third, the OSCAR database has its own limitations. OSCAR does not provide sufficient detail to determine the specific antipsychotics that were prescribed, or the quality (e.g., indication, appropriateness, and dose) of those prescriptions. Additionally, we were unable to adjust our analyses for some residents' demographic characteristics, such as age and sex, or account for any changes in demographic characteristics that occurred over time. Another potentially important variable that was not included in our analyses was the quality and management style of nursing home administration. Through direct- Inc activities and good planning, managers may improve the quality of their organizations?

CONCLUSIONS

The results of this study indicate that patterns of anti- psychotic prescriptions in nursing homes increased significantly between 1996 and 2006. Our multivariate results suggested significant associations between anti- psychotic prescribing and organizational and market characteristics. Specifically, our findings supported the hypotheses that not-for-profit ownership, chain membership, higher Medicaid reimbursement, and higher levels of competition were associated with decreasing antipsychotic medication use. Causal analyses are needed to verify these findings; however, we speculate that future interventions to reduce antipsychotic use in nursing homes should focus on these issues.

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Table 1

Means and Standard Deviations of the Control Variables in 1996 and 2006

Variables	1996 Data Mean (or %)	Standard Deviation	2006 Data Mean (or %)	Standard Deviation
Resident Factors				
Income	26,072	7,095	27,308	7958
Restrained	15%	16	10% [*]	11
Activities of Daily Living	0.28	0.13	0.26	0.12
Incontinent bladder	50%	18	53%	18
Incontinent bowel	41%	19	43%	18
Psychiatric diagnoses	12%	14	16% [*]	16
Mental retardation	3%	6	3%	6
Dementia	42%	19	43%	20
Antianxiety medications	15.5%	9.7	18.51%	9.6
Sedative/hypnotic medications	5.0%	7.4	6.8%	6.9
Antidepressant medications	22.0%	11.3	47.3% [*]	14.2
Facility Factors				
Size	110	76	109	67
Alzheimer special care units	14%	-	18% [*]	-
Average occupancy	84%	20	83%	17
Average Medicaid occupancy	53%	25	52%	24
Hospital based LTC services	11.5	23.7	9.7 [*]	19.0
Staffing Factors				
FTE RNs / 100 beds	5.6	7.2	5.3	7.2
FTE LPNs / 100 beds	9.0	6.8	9.6	7.1
FTE nurse aides / 100 beds	26.7	11.7	27.4	12.0
FTE Medical director	0.11	0.13	0.12	0.15
FTE Physicians	0.46	0.11	0.61	0.13
FTE Physician extenders	0.02	0.09	0.07 [*]	0.17
Number of elderly (square mile)	136	397	134	389

⁺ FTE = full-time equivalent; LTC = long-term care; RN = registered nurse; LPN = licensed practical nurse; NA = Nurse aide

^{*} paired t-test significant at p<.05 or better (comparing 1996 with 2006 data).

Table 2

Means and Standard Deviations of the Primary Independent variables in 1996 and 2006

Variables	1996 Data Mean (or %)	Standard Deviation	2006 Data Mean (or %)	Standard Deviation
Organizational Factors of Interest:¹				
For-profit	65%	-	66%	-
Chain membership	51%	-	53%	-
Market Factors of Interest:²				
Competition (nursing homes)	0.21	0.24	0.21	0.24
Medicaid reimbursement rate (\$)	91.6	19.9	95.3	19.7

Table 3

Ordered Multinomial Logistic Regression Adjusted Odds-Ratio Estimates Examining Antipsychotic Medication Use From 1996 to 2006

		Adjusted Odds Ratio (95% Confidence Interval)
Organizational Factors of Interest:		
For-profit	(AOR for 1 vs. 0)	1.58 (1.51-1.65) ***
Chain membership	(AOR for 1 vs. 0)	0.82 (0.79-0.85) ***
Market Factors of Interest:		
Competition	(AOR for 10% decrease)	1.22 (1.16-1.29) ***
Medicaid reimbursement	(AOR for 10% increase)	0.88 (0.85-0.92) ***

Note: All control variables listed in Table 1 were also included in the analyses.

N = 145,321 nursing home observations

AOR = Adjusted odds ratio

Analyses shown used Generalized Estimating Equations (GEE)

*** Statistically significant AOR at the $p \leq 0.001$ level.