

Unexplained Variation Across US Nursing Homes in Antipsychotic Prescribing Rates

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Background: Serious safety concerns related to the use of antipsychotics have not decreased the prescribing of these agents to nursing home (NH) residents. We assessed the extent to which resident clinical characteristics and institutional prescribing practice were associated with antipsychotic prescribing.

Methods: Antipsychotic prescribing was assessed for a nationwide, cross-sectional population of 16 586 newly admitted NH residents in 2006. We computed facility-level antipsychotic rates based on the previous year's (2005) prescribing patterns. Poisson regressions with generalized estimating equations were used to identify the likelihood of resident-level antipsychotic medication use in 2006, given 2005 facility-level prescribing pattern and NH resident indication for antipsychotic therapy (psychosis, dementia, and behavioral disturbance).

Results: More than 29% (n=4818) of study residents received at least 1 antipsychotic medication in 2006. Of

the antipsychotic medication users, 32% (n=1545) had no identified clinical indication for this therapy. Residents entering NHs with the highest facility-level antipsychotic rates were 1.37 times more likely to receive antipsychotics relative to those entering the lowest prescribing rate NHs, after adjusting for potential clinical indications (risk ratio [RR], 1.37; 95% confidence interval [CI], 1.24-1.51). The elevated risk associated with facility-level prescribing rates was apparent for only NH residents with dementia but no psychosis (RR, 1.40; 95% CI, 1.23-1.59) and residents without dementia or psychosis (RR, 1.54; 95% CI, 1.24-1.91).

Conclusions: The NH antipsychotic prescribing rate was independently associated with the use of antipsychotics in NH residents. Future research is needed to determine why such a prescribing culture exists and whether it could result in adverse health consequences.

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NEARLY 1 IN 3 NURSING home (NH) residents in the United States received antipsychotic drugs in 2007,¹ which is the highest reported level of use in more than a decade. Serious safety concerns related to these agents are increasing.²⁻⁴ In 2005, the Food and Drug Administration

tion in the proportion of NH residents using antipsychotics.⁶ This prescribing variation may reflect differences in the patient case mix and the prevalence of diagnoses of psychoses or dementia with severe behavior problems. Alternatively, antipsychotic medication use may also be driven by NHs' facility-level antipsychotic prescribing rates.⁶ Such prescribing patterns may be considered a "visible artifact of deeper cognitive processes shared by organizational members,"^{7(p90)} and perhaps indicate an institutional prescribing culture. Although previous work supports the role of facility-level factors in resident-level prescribing in Canada,⁶ the extent to which this exists in the United States is unclear.

The objective of the present study is to examine the association between facility-level antipsychotic rates and the use of antipsychotics among NH residents in the United States. We hypothesize that residents who enter NHs with

See also pages 83 and 96

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(FDA) issued warnings of excess mortality associated with the use of these antipsychotic agents for behavioral symptoms in elderly patients with dementia.² Furthermore, a large National Institutes of Health (NIH)-sponsored clinical trial recently concluded that the adverse effects of atypical antipsychotics offset their advantages in older adults with Alzheimer disease (AD).⁵

Recently published data from Ontario, Canada, indicate that there is wide varia-

NH FACILITY-LEVEL ANTIPSYCHOTIC PRESCRIBING RATE AND CHARACTERISTICS

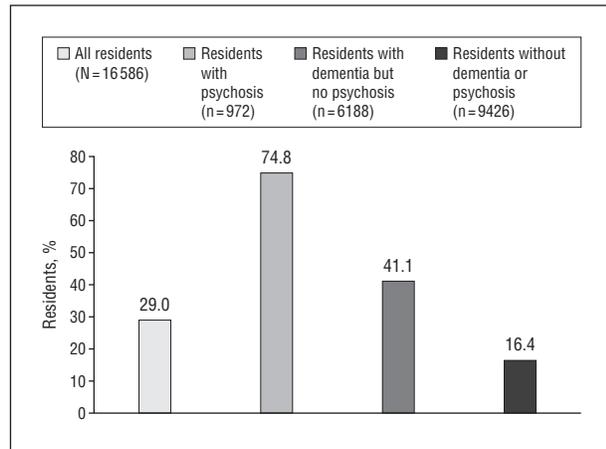


Figure. Use of antipsychotic medications in 2006.

high facility-level antipsychotic prescribing rates would be more likely to receive antipsychotic medications, independent of their clinical indications for this treatment. Findings from this study will help inform policies to target NHs with high antipsychotic prescribing rates.

METHODS

DATA

This study used 2 merged data sources: (1) a nationwide database of 2005-2006 NH prescription drug dispensing records and (2) the 2006 Minimum Data Set (MDS). Both data sets were previously described in detail.⁸ The prescription data come from the pharmacy claims of over 2.5 million individuals living in approximately 16 000 NHs from across 48 states. Pharmacy claims include a variety of prescription drug plans (including private insurance, Medicaid, and Medicare Part D) and those without insurance coverage for drugs. The drug dispensing data include all medications prescribed and administered to NH residents, including over-the-counter drugs and drugs administered on an as-needed basis. Data elements include the National Drug Code, dispensing date, and the state where the NH was located. Linkable MDS records were available for approximately one-third of individuals with prescription data. The MDS is a federally mandated health assessment tool used in US NHs that captures over 300 items about a residents' physical and cognitive functioning. Full assessments occur on admission, when a significant change in clinical status occurs, and annually. Most elements of the MDS demonstrate excellent to good reliability.^{9,10}

STUDY SAMPLE

The sampling frame for this study was 66 181 NH residents newly admitted in 2006 who had at least 1 drug dispensing record. We excluded 46 610 short-stay residents, defined as individuals having an NH stay shorter than 3 consecutive months, because previous research has shown that these individuals differ from long-stay residents.^{11,12} Furthermore, we excluded residents living in small NHs with fewer than 5 residents (n=2985). The final sample size was 16 586 residents admitted to 1257 NHs.

To measure an NH facility-level antipsychotic prescribing rate, we adopted a method developed by Rochon et al.⁶ For each NH with newly admitted residents in 2006, we examined the records of prescription drugs dispensed for all residents in that NH in the previous year (ie, 2005). We used 2005 data for this calculation to establish a facility-level antipsychotic prescribing rate independent of the actual use of antipsychotic drugs for newly admitted residents. This also established the temporal relationship between the 2 variables. The facility-level antipsychotic prescribing rate was defined as the proportion of long-stay residents in the NH receiving at least 1 antipsychotic prescription in 2005. For 1473 residents with stays in multiple NHs, we used their first NH stay for this analysis. Based on the distribution of antipsychotic prescribing rates, NHs were categorized into quintiles (quintile 1 to quintile 5 [hereafter, Q1 to Q5]) of facility prescribing rates. As a sensitivity analysis, we recalculated the antipsychotic rates including short-stay residents and found that the quintile assignments remained substantially similar. (Data not shown but available on request from the corresponding author.)

Nursing home characteristics included number of long-stay residents in the NH during 2005 and location as categorized by US census region.

RESIDENT CHARACTERISTICS

Resident characteristics were drawn from the first MDS admission assessment in 2006. Demographics included age, sex, marital status, and race/ethnicity. We calculated the MDS-Changes in Health, End-stage disease and Symptoms and Signs (CHESS) score to measure frailty of the resident.¹³ The CHESS score, ranging from 0 (no frailty) to 5 (high frailty), is a strong predictor of mortality and health instability in NH residents.¹³ Severity of behavioral problems was measured by the Behavioral Index, which is based on the frequency and number of behaviors including wandering and being verbally or physically abusive and socially inappropriate.¹⁴⁻¹⁶ Ranging from 0 to 2, the Behavioral Index was categorized into normal/mild (0 or 1) and moderate/severe (2) behavioral problems. Cognitive impairment was assessed by the Cognitive Performance Scale (CPS) and categorized as minimal (0-1), moderate (2-3), and severe (4-6).¹⁷ The CPS has been shown to be highly correlated with the Mini-Mental State Examination (MMSE).^{9,17} Residents were classified as having dementia if there was a diagnosis of AD or dementia other than AD or if they received a prescription for an acetyl cholinesterase inhibitor, an ergot alkaloid, or noncompetitive N-methyl D-aspartate receptor antagonist (ie, memantine). Based on a method described by Oliveria et al,¹⁸ we defined residents as having psychoses if they were diagnosed as having schizophrenia, schizoaffective disorder, mood disorder with psychotic features, psychotic symptoms accounted for by a substance, or current major depressive episode with psychotic symptoms of hallucinations or delusions. Because behavioral components were used to compute variables such as the Behavioral Index, CPS, and dementia, it was possible that they were correlated. We performed Pearson correlation coefficient analysis to examine the correlation among the 3 variables and found that the highest correlation coefficient was lower than 0.45. Therefore, all 3 variables were included in the analysis.

STATISTICAL ANALYSES

Descriptive statistics were performed to examine the distribution of the facility and individual characteristics among the fa-

Table 1. Characteristics of Nursing Homes by Facility-Level Antipsychotic Prescribing Rate

Characteristic	Nursing Homes, No. (%)						P Value
	Facility-Level Antipsychotic Prescribing Rate Quintile ^a						
	Overall	Q1 (0-24.3)	Q2 (24.4-29.0)	Q3 (30.0-35.6)	Q4 (35.7-43.7)	Q5 (43.8-100)	
Facility	1257 (100)	240 (19.1)	263 (20.9)	258 (20.5)	255 (20.3)	241 (19.2)	
US census region ^b							
South	400 (31.9)	49 (20.5)	62 (23.8)	91 (35.3)	96 (37.8)	102 (42.5)	<.001
West	161 (12.9)	44 (18.4)	46 (17.6)	29 (11.2)	24 (9.4)	18 (7.5)	
Midwest	491 (39.2)	115 (48.1)	110 (42.1)	93 (36.0)	84 (33.1)	89 (37.1)	
Northeast	200 (16.0)	31 (13.0)	43 (16.5)	45 (17.4)	50 (19.7)	31 (12.9)	
Size, No. of residents							
5-49	71 (5.6)	27 (11.3)	10 (3.8)	11 (4.3)	9 (3.5)	14 (5.8)	<.001
50-99	194 (15.4)	41 (17.1)	40 (15.2)	29 (11.2)	41 (16.1)	43 (17.8)	
100-249	552 (43.9)	98 (40.8)	95 (36.1)	115 (44.6)	114 (44.7)	130 (53.9)	
250-499	314 (25.0)	50 (20.8)	80 (30.4)	67 (26.0)	72 (28.2)	45 (18.7)	
≥500	126 (10.0)	24 (10.0)	38 (14.4)	36 (14.0)	19 (7.5)	9 (3.7)	

^aFacility-level antipsychotic prescribing rates quintiles were based on all long-stay residents in 2005.

^bCells may not add up to 1257 (100%) and quintile facility totals because of missing data.

cility-level antipsychotic quintiles and between individuals with and without antipsychotic therapy. χ^2 Tests were used to compare proportions.

Risk ratios (RRs) of antipsychotic therapy for calendar year 2006 were estimated using Poisson regression and generalized estimating equations. This modeling approach does not require a rare disease assumption, provides valid confidence intervals (CIs) using robust estimation,¹⁹ and adjusts for clustering of residents within a facility. Unadjusted (model 1) and adjusted (models 2-4) models were conducted in the overall population and in the following mutually exclusive clinical subgroups indicated for antipsychotic therapy: (1) residents with psychosis, (2) residents with dementia and no psychosis, and (3) residents without psychosis or dementia. The first 2 groups were considered potential clinical indication groups, while the last was considered as the nonindication group. Adjusted models included successive sets of additional covariates: model 2, facility characteristics (facility size and region); model 3, resident characteristics, including demographics (age, sex, marital status, and race/ethnicity) and general health status; and model 4, antipsychotic indications (Behavioral Index, indicator of dementia, and indicator of psychosis). Note that model 4 was defined individually for each clinical subgroup. We used such a stepwise approach to (1) separate the effect of NH characteristics from resident characteristics and (2) separate the effect of antipsychotic indications from nonantipsychotic indications.

STATA version 10.0 software (StataCorp, College Station, Texas) was used to conduct all statistical analyses, and $P < .05$ was considered statistically significant. The institutional review board of the University of Massachusetts Medical School exempted this research from review.

RESULTS

We identified 16 586 long-stay NH residents who were newly admitted to 1257 NHs in 2006. The facility-level antipsychotic prescribing rates of these NHs in the preceding year ranged from 0% to 24.4% in Q1 to 43.8% to 100% in Q5. In the sample, 972 residents had psychosis, 6188 had dementia but no psychosis, and 9426 had neither psychosis nor dementia. Approximately 29% (n=4818) of all residents received at least 1 antipsy-

chotic medication in 2006. Residents with psychosis had the highest level of use with 74.8% (n=727) using at least 1 antipsychotic, followed by residents with dementia and no psychosis (41.1% [n=2546]) and then residents without dementia or psychosis (16.4% [n=1545]) (**Figure**). Overall, among the 4818 antipsychotic medication users, 1545 (32%) did not have any clinical indication.

Table 1 describes the study NHs by their antipsychotic prescribing rates quintiles in 2005. Comparing Q5 and Q1 NHs, we found that a higher proportion of Q5 NHs were more likely to be located in the South and have fewer than 250 residents. A higher proportion of Q1 NHs were located in the Midwest and had more than 250 residents.

Table 2 describes the study population by quintiles of facility-level antipsychotic prescribing rates. Compared with residents in Q5 NHs, those in Q1 NHs tended to be older (age >75 years: 75% vs 59%; $P < .001$), female (69.4% vs 60.9%; $P < .001$), and white (85% vs 71.9%; $P < .001$). More residents in Q1 NHs were frail (CHES score, 3-5: 24.7% vs 14.0%; $P < .001$) and had a higher CPS score (CPS score, 0-1: 39.2% vs 31.4%; $P < .001$) than residents in Q5 NHs. More residents in Q5 NHs had moderate or severe behavioral problems (Behavioral Index, moderate/severe: 23.5% vs 12.6%; $P < .001$), dementia (52.3% vs 41.4%; $P < .001$), and psychosis (10.3% vs 4.0%; $P < .001$) compared with those in Q1 NHs.

Table 3 gives the distribution of individual characteristics between antipsychotic medication users and nonusers. Residents who were prescribed antipsychotic medications were younger (age ≤ 65 years: 13.7% vs 10.2% [$P < .001$]; and 66-75 years: 19.8% vs 18.8% [$P < .001$]), male (37.6% vs 34.1%; $P < .001$), and less frail (CHES score of 0: 24.9% vs 17.6%; $P < .001$) compared with those who were not using antipsychotics. Antipsychotics tended to be given to residents with moderate and severe behavioral problems (32.3% vs 8.9%; $P < .001$), dementia (68.8% vs 36.9%; $P < .001$), and psychosis (15.1% vs 2.1%; $P < .001$).

The association between resident use of antipsychotics and facility-level prescribing rates in the full sample

Table 2. Facility-Level Antipsychotic Prescribing Rate Quintile by Resident Characteristics^a

Characteristic	Nursing Homes, No. (%)						P Value
	Facility-Level Antipsychotic Prescribing Rate Quintile ^b						
	Overall	Q1 (0-24.3)	Q2 (24.4-29.9)	Q3 (30.0-35.6)	Q4 (35.7-43.7)	Q5 (43.8-100)	
Residents	16 586 (100)	2696 (16.3)	3788 (22.8)	3617 (21.8)	3798 (22.9)	2687 (16.2)	
Age, y							
≤65	1860 (11.2)	204 (7.6)	361 (9.5)	357 (9.9)	457 (12.0)	481 (17.9)	<.001
66-75	3166 (19.1)	460 (17.1)	682 (18.0)	688 (19.0)	717 (18.9)	619 (23.0)	
76-85	6681 (40.3)	1128 (41.8)	1553 (41.0)	1453 (40.2)	1561 (41.1)	986 (36.7)	
>85	4879 (29.4)	904 (33.5)	1192 (31.5)	1119 (30.9)	1063 (28.0)	601 (22.4)	
Sex							
Male	5812 (35.1)	824 (30.6)	1317 (34.8)	1293 (35.8)	1331 (35.1)	1048 (39.1)	<.001
Female	10 759 (64.9)	1869 (69.4)	2469 (65.2)	2324 (64.3)	2464 (64.9)	1632 (60.9)	
Marital status							
Never married	1403 (8.6)	191 (7.1)	305 (8.1)	300 (8.3)	347 (9.1)	260 (9.7)	.004
Married	4278 (26.2)	746 (27.7)	996 (26.3)	904 (25.0)	934 (24.6)	698 (26.0)	
Other	10 905 (65.7)	1759 (65.2)	2487 (65.6)	2413 (66.7)	2517 (66.3)	1729 (64.3)	
Race/ethnicity							
White	12 889 (78.1)	2267 (85.0)	3051 (80.8)	2739 (76.3)	2902 (76.8)	1930 (71.9)	<.001
Black	2182 (13.2)	224 (8.4)	443 (11.7)	516 (14.4)	523 (13.9)	476 (17.7)	
Hispanic	1090 (6.6)	109 (4.1)	185 (4.9)	268 (7.5)	276 (7.3)	252 (9.4)	
Other	336 (2.0)	67 (2.5)	99 (2.6)	68 (1.9)	76 (2.0)	26 (1.0)	
CHESS score							
0	3270 (19.7)	338 (12.5)	532 (14.0)	653 (18.1)	828 (21.8)	919 (34.2)	<.001
1	4952 (29.9)	745 (27.6)	1095 (28.9)	1087 (30.1)	1204 (31.7)	821 (30.6)	
2	4894 (29.5)	946 (35.1)	1269 (33.5)	1094 (30.2)	1015 (26.7)	570 (21.2)	
3-5	3470 (20.9)	667 (24.7)	892 (23.5)	783 (21.6)	751 (19.8)	377 (14.0)	
CPS score							
0-1	6021 (36.3)	1057 (39.2)	1473 (38.9)	1340 (37.1)	1308 (34.4)	843 (31.4)	<.001
2-3	7923 (47.8)	1303 (48.4)	1714 (45.3)	1685 (46.6)	1847 (48.6)	1374 (51.2)	
4-6	2636 (15.9)	334 (12.4)	599 (15.8)	591 (16.3)	643 (16.9)	469 (17.5)	
Behavioral Index							
Normal/mild	13 966 (84.3)	2353 (87.4)	3343 (88.3)	3080 (85.2)	3140 (82.8)	2050 (76.5)	<.001
Moderate/severe	2597 (15.7)	340 (12.6)	441 (11.7)	535 (14.8)	651 (17.2)	630 (23.5)	
Dementia							
No	8927 (53.8)	1581 (58.6)	2187 (57.7)	1940 (53.6)	1938 (51.0)	1281 (47.7)	<.001
Yes	7659 (46.2)	1115 (41.4)	1601 (42.3)	1677 (46.4)	1860 (49.0)	1406 (52.3)	
Psychosis							
No	15 614 (94.1)	2589 (96.0)	3655 (96.5)	3443 (95.2)	3518 (92.6)	2409 (89.7)	<.001
Yes	972 (5.9)	107 (4.0)	133 (3.5)	174 (4.8)	280 (7.4)	278 (10.3)	

Abbreviations: CHESS, Changes in Health, End-stage disease and Symptoms and Signs score; CPS, Cognitive Performance Scale.

^aData are given as number (percentage) unless otherwise indicated. Number of residents may not add up to 16 586 (100%) and quintile resident totals in each characteristic because of missing data.

^bFacility-level antipsychotic prescribing rate quintile was based on all long-stay residents in 2005.

is given in **Table 4**. Residents in Q5 NHs had double the risk ratio (RR) of receiving antipsychotics (model 1: RR, 2.00; 95% confidence interval [CI], 1.78-2.24) compared with residents in Q1 NHs. Adjusting for NH characteristics did not change the magnitude of the association (Q5 vs Q1, model 2: RR, 1.95; 95% CI, 1.73-2.20). Adjusting for demographics and health status, reduced the RR (Q5 vs Q1 model 3: RR, 1.60; 95% CI, 1.44-1.78). The RR was further reduced after controlling for potential indication of antipsychotics; however, compared with residents in Q1 NHs, those in Q5 NHs still had higher risk of being prescribed antipsychotics (model 4: RR, 1.37; 95% CI, 1.24-1.51).

Table 4 also shows that antipsychotic medication use across the quintiles of facility-level prescribing rates varied by clinical subgroups. Among the residents with psychosis, antipsychotic medication use did not vary sig-

nificantly across quintiles in the full model. After adjusting for all covariate sets (model 4 for psychosis), the RR for Q5 to Q1 NHs was 1.14 (95% CI, 0.98-1.33).

However, facility-level prescribing quintile did predict use of antipsychotics for the 2 other clinical subgroups. For residents with dementia and no psychosis, those residing in Q5 NHs were more likely to be prescribed antipsychotics (model 1: RR, 1.65; 95% CI, 1.45-1.88) relative to those in Q1 NHs, and the magnitude and significance of RR changed little after adjusting for facility characteristics (model 2: RR, 1.58; 95% CI, 1.39-1.80) and then for demographics and health status (model 3: RR, 1.50; 95% CI, 1.30-1.71). After adjusting for Behavioral Index, the RR was still statistically significant (model 4: RR, 1.40; 95% CI, 1.23-1.59).

Among the residents without psychosis or dementia, facility-level prescribing quintile was significantly asso-

ciated with use of antipsychotics (Q5 vs Q1, model 1: RR, 1.79; 95% CI, 1.44-2.21). After full adjustment, the association remained statistically significant (Q5 vs Q1, model 4: RR, 1.54; 95% CI, 1.24-1.91).

COMMENT

This study provides evidence of a facility-level variation in the prescribing of antipsychotics in US NHs. We found that the likelihood of a newly admitted NH resident to receive an antipsychotic medication was strongly and independently related to the facility-level antipsychotic prescribing rate, even after adjustment for clinical and sociodemographic characteristics. Residents newly admitted to NHs with the highest prescribing rates were 1.37 times more likely to receive an antipsychotic medication relative to those in the NHs with the lowest prescribing rates. The influence of the facility-level prescribing rate was most apparent in residents without psychosis, who have the weakest indication for antipsychotic medication use.

Another important finding in this study is the high use of antipsychotics in NHs in the period after the 2005 FDA mortality warnings for antipsychotic agents. Our finding that more than 29% of newly admitted NH residents received antipsychotic medications in 2006 is corroborated by other sources,³ including a sample of 8 states in 2006 reporting antipsychotic prevalence of 27.6% among NH residents²⁰ and a sample from Canada.⁶

The high use of antipsychotics may reflect a growing proportion of NH residents diagnosed as having psychoses.²⁰ However, residents diagnosed as having schizophrenia, bipolar disorder, or aggressive behavioral symptoms of dementia accounted for only a small proportion of antipsychotic medication use.²⁰ In addition, we found that 16.4% of residents who had no clinical indication for antipsychotic therapy (no psychoses and no dementia) received antipsychotic medications. Ad hoc analyses to isolate the role of behavior on the use of antipsychotics showed that the risk of receiving antipsychotics steadily increased with higher facility-level prescribing rates but only for residents with dementia and normal/mild behavior problems. In contrast, this association was not evident for residents with dementia and moderate/severe behavior problems (data not shown but available on request from the corresponding author). This suggests that managing behavioral problems plays an important role in facility-level decisions about antipsychotic prescribing. We also compared antipsychotic rates by payment status and found dual-eligible residents were more likely than Medicare-only residents to receive an antipsychotic medication (RR, 1.2; 95% CI, 1.15-2.56). Race/ethnicity was significantly associated with antipsychotics use. Compared with white residents, black residents were 11% less likely to receive an antipsychotic medication. In residents without psychosis and dementia, black and Hispanic residents were 30% and 22%, respectively, less likely than white residents to be prescribed an antipsychotic medication.

Our study suggests that facility-level factors such as organizational culture may play a role in medication prescribing and is consistent with previous studies support-

Table 3. Resident-Level Use of Antipsychotics by Resident Characteristics

Characteristic	Resident-Level Use of Antipsychotics, No. (%)		P Value
	No	Yes	
Residents	11 768 (71.0)	4818 (29.0)	
Age, y			
≤65	1198 (10.2)	662 (13.7)	<.001
66-75	2213 (18.8)	953 (19.8)	
76-85	4706 (40.0)	1975 (41.0)	
>85	3651 (31.0)	1228 (25.5)	
Sex			
Male	4006 (34.1)	1807 (37.6)	<.001
Female	7753 (65.9)	3005 (62.5)	
Marital status			
Never married	946 (8.0)	457 (9.5)	<.001
Married	2967 (25.2)	1311 (27.2)	
Other	7855 (66.8)	3050 (63.3)	
Race/ethnicity			
White	9163 (78.3)	3726 (77.7)	<.05
Black	1545 (13.2)	637 (13.3)	
Hispanic	739 (6.3)	351 (7.3)	
Other	253 (2.2)	83 (1.7)	
CHESS score			
0	2069 (17.6)	1201 (24.9)	<.001
1	3471 (29.5)	1481 (30.7)	
2	3636 (30.9)	1258 (26.1)	
3-5	2592 (22.0)	878 (18.2)	
CPS score ^a			
0-1	5071 (43.1)	950 (19.7)	<.001
2-3	5156 (43.8)	2767 (57.5)	
4-6	1538 (13.1)	1098 (22.8)	
Behavioral Index			
Normal/mild	10 706 (91.1)	3260 (67.7)	<.001
Moderate/severe	1041 (8.9)	1556 (32.3)	
Dementia			
No	7422 (63.1)	1505 (31.2)	<.001
Yes	4346 (36.9)	3313 (68.8)	
Psychosis			
No	11 523 (97.9)	4091 (84.9)	<.001
Yes	245 (2.1)	727 (15.1)	

Abbreviations: CHESS, Changes in Health, End-stage disease and Symptoms and Signs score; CPS, Cognitive Performance Scale.

^aCPS score was grouped to 0 to 1 and 2 to 6 for χ^2 test because of small number of residents with a CPS score of 4 to 6.

ing the impact of culture on the use of antipsychotics in Canada⁶ and feeding tubes for NH residents with dementia.²¹ There has been a growing interest in the role of organizational culture in medication prescribing in NHs.^{7,22,23} Organizational culture is a broad concept that encompasses the shared values, beliefs, and assumptions of a group or members within a group, such as a NH and the NH's clinicians and staff.⁷ The perceptions shared by individuals working within a NH may exhibit itself as a facility-level preference for certain therapeutic modalities. Organizational culture may be particularly important in the use of antipsychotics in NHs since prescribing decisions often occur in NHs without direct contact between the prescriber and resident.

The study was subject to limitations. First, this is a cross-sectional study, thus we are not able to draw conclusions about causal relationships. Second, the data come from a single long-term care pharmacy provider with a

Table 4. Adjusted Risk Ratios of Resident-Level Use of Antipsychotics by Facility-Level Antipsychotic Prescribing Rate, According to Resident Clinical Subgroups^a

Model	Relative Risk (95% Confidence Interval)			
	All Residents	Residents With Psychosis	Residents With Dementia and No Psychosis	Residents Without Dementia or Psychosis
Model 1: only facility-level antipsychotic prescribing rate quintiles				
Q1	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Q2	1.11 (0.99-1.25)	1.14 (0.94-1.37)	1.10 (0.97-1.25)	1.10 (0.90-1.35)
Q3	1.35 (1.20-1.51)	1.31 (1.11-1.55)	1.20 (1.06-1.36)	1.33 (1.08-1.64)
Q4	1.48 (1.33-1.66)	1.07 (0.89-1.28)	1.31 (1.15-1.49)	1.48 (1.21-1.80)
Q5	2.00 (1.78-2.24)	1.28 (1.08-1.50)	1.65 (1.45-1.88)	1.79 (1.44-2.21)
Model 2: model 1 + facility characteristics ^b				
Q1	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Q2	1.12 (0.99-1.25)	1.13 (0.95-1.35)	1.09 (0.95-1.23)	1.10 (0.90-1.35)
Q3	1.33 (1.19-1.50)	1.27 (1.08-1.50)	1.16 (1.02-1.32)	1.35 (1.09-1.67)
Q4	1.46 (1.30-1.63)	1.06 (0.88-1.27)	1.26 (1.10-1.43)	1.51 (1.23-1.85)
Q5	1.95 (1.73-2.20)	1.25 (1.06-1.47)	1.58 (1.39-1.80)	1.84 (1.46-2.31)
Model 3: model 2 + demographics + health status ^c				
Q1	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Q2	1.11 (1.00-1.24)	1.13 (0.95-1.34)	1.07 (0.94-1.22)	1.07 (0.87-1.30)
Q3	1.26 (1.13-1.40)	1.23 (1.05-1.44)	1.14 (1.00-1.29)	1.28 (1.04-1.57)
Q4	1.34 (1.20-1.49)	1.03 (0.86-1.22)	1.23 (1.08-1.40)	1.35 (1.10-1.65)
Q5	1.60 (1.44-1.78)	1.16 (0.99-1.36)	1.50 (1.30-1.71)	1.55 (1.25-1.92)
Model 4: model 3 + indication of antipsychotics (defined separately in the 3 clinical subgroups) ^d				
Q1	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Q2	1.10 (0.99-1.21)	1.13 (0.96-1.34)	1.07 (0.95-1.22)	1.08 (0.89-1.32)
Q3	1.19 (1.07-1.31)	1.24 (1.06-1.44)	1.12 (0.99-1.27)	1.26 (1.03-1.55)
Q4	1.19 (1.08-1.32)	1.02 (0.86-1.21)	1.19 (1.05-1.35)	1.36 (1.11-1.67)
Q5	1.37 (1.24-1.51)	1.14 (0.98-1.33)	1.40 (1.23-1.59)	1.54 (1.24-1.91)

^aRelative risks for other covariates were not shown but are available on request from the corresponding author.

^bModel 2: facility characteristics (nursing home size, region).

^cModel 3: demographics (age, sex, race/ethnicity, marital status) + health status (CHESS [Changes in Health, End-stage disease, and Symptoms and Signs] and CPS [Cognitive Performance Scale] scores).

^dModel 4 (all residents): indication of antipsychotics (Behavioral Index, dementia, or psychosis); model 4 (psychosis): indication of antipsychotics (Behavioral Index or dementia); model 4 (dementia without psychosis): indication of antipsychotics (Behavioral Index); model 4 (no dementia and psychosis): indication of antipsychotics (Behavioral Index).

large nationwide sample; however, our results may not be generalized to all Medicare enrollees. A comparison of the geographic residence of our study sample to that of the NH residents in the December 2006 Center for Medicare and Medicaid Services Online Survey Certification And Reporting (OSCAR) Data survey shows a similar distribution (Northeast, 24% vs 23%; Midwest, 36% vs 29%; South, 28% vs 34%; and West, 11% vs 14%).²⁴ Third, we have excluded NHs with fewer than 5 residents in 2005 because their antipsychotic rates were unstable owing to the small number of residents. We further excluded short-stay residents because of their distinct characteristics from long-stay residents. Limiting our study sample therefore prevents us from extending the interpretation of our findings to smaller facilities. Fourth, the prevalence of psychoses in our sample was lower compared with that found in another study using medical records.¹⁸ Thus, we may have underestimated the prevalence of psychoses in this sample. Fifth, the MDS itself has limitations, including the limited capture of individual resident behaviors that may disturb other residents and inhibit their care. This may contribute to an underestimation of behavioral problems for individual residents. Finally, owing to data limitation, we may not

have measured potentially important facility-level factors, such as location of the NHs (rural vs urban)²¹ and staffing, which have been previously linked to quality of care in NHs.^{25,26} For example, a higher level of trained nursing staff may improve patient assessment and provide more informed administering and monitoring of antipsychotics in patients with dementia.

In conclusion, safety concerns continue to persist in the use of antipsychotic medications in NH residents whose benefits from these agents are unclear. This study provides evidence that antipsychotic prescribing varies by NHs, independent of residents' clinical characteristics, and NHs antipsychotic prescribing culture may be an important component to explain such variation. Future research is needed to determine why such a prescribing culture exists and whether there are adverse health consequences as a result of our observed facility-level antipsychotic prescribing rate. This study may also inform future policies to target NHs with high antipsychotic prescribing rates to improve quality of care for NH residents.

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