The Use of Atypical Antipsychotics in Nursing Homes

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Background: Use of atypical antipsychotics for "off-label" indications, such as behavioral and psychological symptoms of dementia, depression, and bipolar disorder, have been frequently reported, although not systematically studied. We describe the pattern of atypical antipsychotic use among nursing home residents and identify demographic and clinical correlates.

Method: We conducted a cross-sectional study on 139,714 nursing home residents living in 1732 nursing homes in 5 U.S. states from Jan. 1, 1999, to Jan. 31, 2000. Data were obtained from the computerized Minimum Data Set (MDS) assessment records.

Results: Behavior problems associated with cognitive impairment were manifest in 86,514 residents, and, of these, 18.2% received an antipsychotic. Approximately 11% received an atypical antipsychotic, while 6.8% received a conventional agent. Clinical correlates of atypical antipsychotic use were Parkinson's disease (adjusted odds ratio [OR] = 1.57, 95% confidence interval [CI] = 1.34 to 1.84), depression (OR = 1.35, 95% CI = 1.24 to 1.46), antidepressant use (OR = 1.38, 95% CI = 1.27 to 1.49), Alzheimer's disease (OR = 1.21, 95% CI = 1.12 to 1.32), non-Alzheimer dementia (OR = 1.15, 95% CI = 1.07 to 1.24), and cholinesterase inhibitor use (OR = 1.74, 95% CI = 1.52 to 1.98). Severe functional impairment was inversely related to atypical antipsychotic use (OR = 0.76, 95% CI = 0.65 to 0.89).

Conclusion: Atypical antipsychotics are now used more than conventional antipsychotic agents in U.S. nursing homes. Indications and dosages seem appropriate relative to labeling. Clinical and demographic differences between atypical and conventional antipsychotic users tend to be relatively small, suggesting that other factors may explain the choice of prescribing physicians. The impact of facility factors, economic forces, and physician characteristics needs to be investigated.

(J Clin Psychiatry 2003;64:1106–1112)

The pharmacologic treatment of psychotic and disruptive behavior has historically been managed using conventional antipsychotic agents. However, even at therapeutic doses, these agents can produce troublesome side effects. This is true especially for elderly people, who show increased susceptibility to extrapyramidal syndrome, sedation, delirium, anticholinergic effects, and tardive dyskinesia.[1]

Atypical antipsychotics represent a newer class of drugs characterized by a distinct pharmacologic and clinical profile.[2] These agents have become the new standard of care owing to their reported advantages over conventional agents, including better side effect profiles. In particular, atypical antipsychotics are thought to be less likely to cause extrapyramidal symptoms (EPS) and tardive dyskinesia.[3–5]

The U.S. Food and Drug Administration (FDA) has approved the use of atypical antipsychotics exclusively for the treatment of schizophrenia. These drugs, however, are commonly used for off-label indications. Over 70% of prescriptions are for conditions other than schizophrenia.[6] These conditions include depression, bipolar disorder, and psychosis associated with dementia in a geriatric population.[6] Yet, information about the efficacy and safety of atypical antipsychotics used for off-label indications in the elderly is sparse and generally of low quality.[7,8]

In nursing homes, the potential for misuse of psychotropic drugs in the treatment of psychosis and behavioral disturbances has been a concern for many years.[9,10] Over the last decade, the pattern of psychotropic medication use in nursing homes has changed substantially. These changes are due to some extent to the regulations implemented as part of the Omnibus Budget Reconciliation Act of 1987 and the Centers for Medicare and Medicaid (CMS) guidelines in 1990.[11–13] In general, there has been a reduction in the use of antipsychotics and an increase in the use of antidepressants. However, the reported rates of psychotropic drug use show striking interfacility and interstate variation.[14] Nonetheless, while the rate of use of any antipsychotic drugs in nursing homes is well characterized, no data are available on the relative use of atypical and conventional antipsychotics. In particular, information on the relative use among nursing home residents with behavioral and psychological symptoms of dementia is lacking.

Therefore, the aim of this study was to describe the patterns of atypical antipsychotic use and to identify sociodemographic and clinical correlates of their use in nursing homes.

METHOD

Data Source

We used the Systematic Assessment of Geriatric Drug Use via Epidemiology (SAGE) database, which contains data from the Minimum Data Set (MDS). The MDS is a standardized, clinically based assessment instrument that collects information on each nursing home resident's demographic, functional, medical, psychological, and cognitive status. CMS, formerly the Health Care Financing Administration, requires that each Medicare/Medicaid certified nursing home conduct an MDS assessment of all residents upon admission and quarterly thereafter. Since June 22, 1998, CMS has maintained a centralized repository of all MDS data (version 2.0)[15] used for administrative and research purposes.

Study Sample

Collecting detailed drug data at each MDS assessment is not mandated by CMS. Preliminary analyses revealed that not all nursing home facilities collected this information. Thus, we analyzed data from nursing home residents in the 5 states (Kansas, Maine, Mississippi, Ohio, South Dakota) that had complete drug information from Jan. 1, 1999, to Jan. 31, 2000. In addition, we included facilities in which at least 95% of residents had complete drug data. We included only long-stay residents (i.e., living in the facility for at least 1 year) to focus on drug use patterns, which reflect treatments in the nursing homes. Study participants were at least 65 years of age. Our final sample consisted of 139,714 residents from 1732 facilities.

Antipsychotic Use

Nursing home staff recorded the national drug code (NDC), the dose, and the frequency of administration for up to 18 medications taken by the resident in the 7 days before the assessment. The SAGE database links NDC codes to hierarchical structures that make it possible to group drugs by therapeutic class. Atypical antipsychotics included risperidone, olanzapine, quetiapine, and clozapine. Conventional antipsychotics included chlorpromazine, chlorprothixene, fluphenazine, haloperidol, loxapine, mesoridazine, molindone, perphenazine, prochlorperazine, promazine, thioridazine, thiothixene, and trifluoperazine.

Resident Characteristics

To evaluate functional status, we used the Activities of Daily Living scale (ADL),[16] a 5-level score based on the resident's performance in 7 areas: dressing, eating, toileting, bathing, locomotion, transferring, and incontinence.

The MDS includes these data. We classified the degree of dependence on assistance with daily living as mild (ADL score 0–1), moderate (ADL score 2–3), or severe (ADL score 4–5). We used the Cognitive Performance Scale (CPS)[17] to measure residents' cognitive status. The CPS is a validated scale embedded in the MDS that ranges from 0 (intact cognition) to 6 (severe dementia) and has a good correlation with the Mini-Mental State Examination.[18] The CPS includes the following MDS items: short-term memory, cognitive skills for daily decision making, ability to be understood by others, self-performance in eating, and comatose status. We categorized cognitive impairment as minimal (CPS score 0–1), moderate (CPS score 2–3), or severe (CPS score 4–6).

The degree of severity of psychotic and behavioral problems was evaluated by an MDS-based index previously used in research.[19] Residents were considered to have severe symptoms if they were verbally or physically abusive and socially inappropriate every day. Residents with moderate symptoms were those exhibiting wandering, or verbally/physically abusive behavior, and who were socially inappropriate only on occasions, but less than daily. Residents exhibiting at least 1, but not all, of the aforementioned symptoms were classified as mild/normal.

The MDS active clinical diagnoses section provides information about residents' neurologic and psychiatric conditions that may be associated with psychosis. The diagnoses include Alzheimer's disease, non-Alzheimer dementia, Parkinson's disease, depression, bipolar disease, anxiety disorder, and medical conditions such as diabetes, hypertension, heart failure, and arrhythmia. The MDS requires staff to record medical diagnoses that affect residents at the time of the assessment; the validity and accuracy of such diagnoses in the SAGE database have been previously evaluated.[20,21] We also considered concomitant medications, focusing on those that present a potential for interacting with antipsychotics, including antidepressants, antianxiety agents, hypnotics, cholinesterase inhibitors, antiparkinsonian agents, antihypertensives, and antiarrhythmics. We also considered information about recent history of fall in the last 30 days, as well as presence of bladder or bowel incontinence.

Analytic Plan

We examined the overall prevalence of atypical versus conventional antipsychotic use in the study sample. We also estimated prevalence according to the clinical indication reported for the use of antipsychotics. We grouped residents in 3 categories of appropriateness of use according to the CMS quality indicator definitions.[22] Residents with any of the following diagnoses were considered appropriate candidates for antipsychotic use: schizophrenia, paranoid disorders, Tourette's disorder, Huntington's disease, and other nonorganic psychoses including psychotic

Table 1. Prevalence (%) of Antipsychotic Use by CMS-Defined Categories of Appropriate Use

Antipsychotic Treatment	Potentially Inappropriate[a] (N = 48,152)	Potentially Appropriate[b] (N = 86,514)	Appropriate[c] (N = 5048)	Total (N = 139,714)
No antipsychotic	96.1	81.8	31.7	85.0
Atypical	2.0	10.7	31.2	8.5
Conventional	1.8	6.8	30.8	5.9
Both	0.1	0.6	6.3	0.6

[a]Potentially inappropriate use category includes residents not included in either of the 2 appropriate use categories.
[b]Potentially appropriate use category includes residents with behavior problems as indicated by verbal abuse, physical abuse, or socially inappropriate/disruptive behavior and with cognitive impairment as indicated by decision problems and short-term memory problems.
[c]Appropriate use category includes residents having any of the following conditions: schizophrenia, paranoid disorders, Tourette's disorder, Huntington's disease, other nonorganic psychoses including psychotic conditions due to or provoked by emotional stress or environmental factors as major part of etiology.
Abbreviation: CMS = Centers for Medicare and Medicaid.

conditions due to or provoked by emotional stress or environmental factors as a major part of the etiology. Residents for whom antipsychotic use was potentially appropriate included those who were verbally or physically abusive or manifested a socially inappropriate/disruptive behavior associated with cognitive impairment, as indicated by the presence of problems in decision-making and short-term memory deficits. Per the CMS quality indicator definitions, the remaining residents were those for whom antipsychotic use was considered potentially inappropriate.

To describe patterns of antipsychotic use, we restricted our analytic sample to residents for whom antipsychotic use was potentially appropriate. We compared users of atypical versus conventional antipsychotics with respect to demographic characteristics (age, gender, race/ethnicity, body mass index [BMI]), functional status, cognitive function, behavior problems, medical conditions, drug use, and payment source. We calculated crude odds ratios for atypical antipsychotic use by residents' characteristics and then adjusted estimates and 95% confidence intervals by a logistic regression model.

RESULTS

Overall, 15% of residents received an antipsychotic drug with 8.5% taking an atypical agent and 5.9% taking a conventional antipsychotic. Less than 1% received 2 concomitant antipsychotics. Table 1 shows the prevalence of use by underlying level of appropriateness. The highest rates were documented in residents for whom antipsychotics were most likely to be appropriate, with no difference between atypical and conventional agents (31.2% vs. 30.8%, respectively). Residents in the potentially appropriate category showed much lower rates of antipsychotic use, although atypical agents (10.7%) were used more often than conventional antipsychotics (6.8%). Among residents in the potentially inappropriate category, only 3.9% were receiving an antipsychotic.

Table 2 describes the drug regimens of potentially appropriate antipsychotic medications. Among atypical agents, risperidone was the most commonly used, followed by olanzapine and quetiapine. Clozapine was rarely prescribed. In the case of atypical antipsychotics, nearly 100% of the prescriptions were standing orders. Among conventional antipsychotics, haloperidol was by far the most commonly used, but thioridazine and perphenazine were also frequently prescribed. Other conventional antipsychotics were less frequent therapeutic options. Drug use, PRN, varied substantially, from 55% in the case of prochlorperazine to 2% for thioridazine.

The demographic and clinical characteristics of potentially appropriate antipsychotic users by drug class are shown in Table 3. There appears to be no age difference between the 2 groups, but more women were taking atypical antipsychotics (73.1%) than typical antipsychotics (69.6%). Residents taking atypical antipsychotics were more likely to have a BMI equal to or greater than 25.0 kg/m^2 relative to residents taking conventional antipsychotics (40.8% vs. 36.3%). Atypical antipsychotic users were less likely to have severe functional impairment (43.1% vs. 48.0%) and cognitive deficits (44.9% vs. 47.5%) in comparison to conventional antipsychotic users. Yet, no difference in the pattern and severity of behavioral problems was detectable. In general, neurologic and psychiatric diagnoses were more prevalent among residents receiving atypical than conventional antipsychotics, with more substantial differences in the case of depression (51.1% vs. 38.6% for users of atypical and conventional agents, respectively). Hypertension was diagnosed in 50% of atypical users and in 47.1% of conventional users, whereas there was no difference by antipsychotic class for other cardiovascular diseases and diabetes. Of atypical antipsychotic users, 49.8% were coprescribed an antidepressant compared with only 37.3% of conventional users; these figures were 10.7% and 6.2%, respectively, in the case of cholinesterase inhibitors. Another factor related to the use of a specific antipsychotic class was the source of payment for nursing home stay; atypical users were more likely to be self-pay residents relative to users of conventional agents (26.6% vs. 22.8%, respectively).

Table 4 shows crude and adjusted odds ratios (OR) along with 95% confidence intervals of receiving atypical antipsychotics among potentially appropriate users. The likelihood of taking atypical antipsychotics appeared to increase as BMI increased. Relative to those with BMI less than 18.5 kg/m^2, residents with BMI equal to or greater

Table 2. Drug Regimens of Potentially Appropriate Antipsychotic Use Among Nursing Home Residents

Antipsychotic Type	N	Standing Orders %	PRN %	Daily Dose Mode (mg)	Daily Dose Range (mg)
Atypical					
Clozapine	168	100	0	25	12.5–300
Olanzapine	2611	100	0	5	2.5–10
Quetiapine	663	99	1	50	25–400
Risperidone	6836	99	1	1	0.5–4
Conventional					
Chlorpromazine	299	83	17	50	5–400
Chlorprothixene	19	100	0	NA	NA
Fluphenazine	217	95	5	1	0.5–10
Haloperidol	3845	85	15	0.5	0.25–25
Loxapine	146	94	6	5	2.5–100
Mesoridazine	79	95	5	10	10–200
Molindone	76	100	0	5	5–50
Perphenazine	640	97	3	2	2–24
Prochlorperazine	57	45	55	10	5–50
Promazine	312	83	17	100	100
Thioridazine	1376	98	2	10	5–400
Thiothixene	201	99	1	2	0.5–20
Trifluoperazine	107	99	1	2	0.5–40

Abbreviations: NA = not available, PRN = as required.

Table 3. Demographic and Clinical Characteristics of Potentially Appropriate Antipsychotic Users by Drug Class

Characteristic	Atypical Users (N = 9294) %	Conventional Users (N = 5881) %
Age group, y		
65–74	15.1	16.2
75–84	41.4	38.9
85+	43.5	44.9
Female gender	73.1	69.6
Race/ethnicity		
White, not of Hispanic origin	89.0	88.2
Black, not of Hispanic origin	10.2	11.0
Hispanic	0.4	0.4
Other	0.4	0.4
Body mass index		
$< 18.5 \text{ kg/m}^2$	9.6	13.0
$18.5–24.9 \text{ kg/m}^2$	49.5	50.7
$25.0–29.9 \text{ kg/m}^2$	27.7	25.3
$\geq 30.0 \text{ kg/m}^2$	13.1	11.0
Behavior index		
Mild	39.6	40.2
Moderate	46.2	46.3
Severe	14.2	13.5
Functional impairment (ADL score)		
Mild (0–1)	8.4	6.9
Moderate (2–3)	48.5	45.1
Severe (4–5)	43.1	48.0
Cognitive deficits (CPS score)		
Mild (0–1)	2.1	2.3
Moderate (2–3)	53.0	50.2
Severe (4–6)	44.9	47.5
Alzheimer's disease	33.7	29.9
Non-Alzheimer's dementia	61.6	59.4
Parkinson's disease	9.5	7.4
Depression	51.1	38.6
Other mood disorders[a]	27.0	23.8
Diabetes	20.1	19.7
Hypertension	50.0	47.1
Heart failure	22.7	23.0
Arrhythmia	13.8	14.5
Recent history of fall (last 30 days)	24.6	24.6
Bladder incontinence	77.4	76.3
Bowel incontinence	64.3	66.4
Drug use		
Antidepressant use	49.8	37.3
Antianxiety hypnotic use	28.1	27.4
Cholinesterase inhibitor use	10.7	6.2
Antiparkinsonian agent use	8.8	8.6
Antihypertensive drug use	61.7	60.9
Antiarrhythmic drug use	21.6	23.0
Payment source		
Medicaid	59.7	59.9
Medicare	11.2	14.8
Self-pay	26.6	22.8

[a]Includes anxiety disorder and bipolar disease.
Abbreviations: ADL = Activities of Daily Living scale, CPS = Cognitive Performance Scale.

than 30.0 kg/m² were more likely to receive atypical than conventional antipsychotics (OR = 1.47). Residents with a moderate to severe degree of functional impairment were 0.87 and 0.76 times, respectively, as likely to receive atypical than conventional antipsychotics relative to residents with only mild deficit. Parkinson's disease and depression were the strongest clinical predictors of atypical antipsychotic use (OR = 1.57 and 1.35, respectively). Consistently, residents taking antidepressants or a cholinesterase inhibitor were 1.38 and 1.74 times more likely to receive an atypical than a conventional antipsychotic. Relative to Medicaid patients, residents under Medicare coverage were 0.91 times as likely to receive atypical antipsychotics, whereas self-pay residents were 1.22 times as likely.

DISCUSSION

The results of the present study show that, overall, 15% of elderly people living in nursing homes receive antipsychotic medications. The use of antipsychotics in general and more so in the nursing home environment has been a matter of concern for many years. Reports[9,10] of high rates of use have tainted the entire nursing home industry with accusations of institutional malpractice and chemical restraint of patients. Since high rates of chemical restraint were reported to go hand-in-hand with the application of physical restraints, the use of any antipsychotic agent was considered tantamount to poor care.[9,23] In the past 15 years, policy makers, regulatory agencies, and the scientific community at large have contributed the necessary legal, economic, and medical constraints to limit the inappropriate use of antipsychotics in nursing homes.

The overall prevalence of antipsychotic use reported in the present study is similar to that documented by other studies. Using aggregate data from all nursing homes in the contiguous United States in 1997, Hughes and colleagues found that the prevalence of antipsychotic use was approximately 17% to 18%.[24] United States estimates

Table 4. Correlates of the Likelihood of Receiving Atypical Antipsychotics Among Potentially Appropriate Users

Characteristic	Crude Odds Ratio	Adjusted Odds Ratio[a]	95% Confidence Interval
Age group, y			
65–74	1.00	1.00	…
75–84	1.14	1.09	0.99 to 1.21
85+	1.04	1.05	0.95 to 1.17
Female gender	1.19	1.13	1.04 to 1.22
Race/ethnicity			
White, not of Hispanic origin	1.00	1.00	…
Black, not of Hispanic origin	0.92	1.02	0.91 to 1.14
Hispanic	0.95	0.93	0.57 to 1.54
Other	1.06	1.21	0.70 to 2.08
Body mass index			
< 18.5 kg/m^2	1.00	1.00	…
18.5–24.9 kg/m^2	1.31	1.24	1.11 to 1.39
25.0–29.9 kg/m^2	1.47	1.38	1.22 to 1.57
≥ 30.0 kg/m^2	1.60	1.47	1.27 to 1.69
Behavior index			
Mild	1.00	1.00	…
Moderate	1.01	0.99	0.92 to 1.07
Severe	1.07	1.10	0.99 to 1.23
Functional impairment (ADL score)			
Mild (0–1)	1.00	1.00	…
Moderate (2–3)	0.88	0.87	0.75 to 1.00
Severe (4–5)	0.74	0.76	0.65 to 0.89
Cognitive deficit (CPS score)			
Mild (0–1)	1.00	1.00	…
Moderate (2–3)	1.15	1.08	0.85 to 1.36
Severe (4–6)	1.03	1.07	0.84 to 1.36
Alzheimer's disease	1.19	1.21	1.12 to 1.32
Non-Alzheimer's dementia	1.10	1.15	1.07 to 1.24
Parkinson's disease	1.31	1.57	1.34 to 1.84
Depression	1.67	1.35	1.24 to 1.46
Other mood disorders[b]	1.19	1.07	0.99 to 1.17
Diabetes	1.02	1.00	0.92 to 1.09
Hypertension	1.12	1.08	1.01 to 1.16
Heart failure	0.98	0.99	0.91 to 1.08
Arrhythmia	0.95	0.94	0.85 to 1.04
Recent history of fall (last 30 days)	1.00	1.02	0.95 to 1.11
Bladder incontinence	1.07	1.07	0.98 to 1.18
Bowel incontinence	0.91	0.99	0.90 to 1.08
Drug use			
Antidepressant use	1.66	1.38	1.27 to 1.49
Antianxiety hypnotic use	1.04	1.00	0.92 to 1.08
Cholinesterase inhibitor use	1.83	1.74	1.52 to 1.98
Antiparkinsonian agent use	1.02	0.79	0.67 to 0.92
Antihypertensive drug use	1.03	0.99	0.92 to 1.07
Antiarrhythmic drug use	0.93	1.00	0.91 to 1.09
Payment source			
Medicaid	1.00	1.00	…
Medicare	0.76	0.91	0.81 to 1.01
Self-pay	1.17	1.22	1.12 to 1.33

[a]Derived from a logistic regression model including all variables in the table as covariates.
[b]Includes anxiety disorder and bipolar disease.
Abbreviations: ADL = Activities of Daily Living scale, CPS = Cognitive Performance Scale.

differ substantially from those of other western countries, but explanations for this variability remain unclear. In a study of 3 nursing homes in Newcastle, United Kingdom, antipsychotics were used by 38% of the residents in 1999 and by 37% in 2001.[25] In a cross-national comparison of institutions in 6 countries between 1993 and 1996, substantial variability in the use of antipsychotic drugs in nursing homes was reported.[26] Estimates ranged from 7.5% in Japan to 26.5% in Sweden; the estimate from U.S. nursing homes was 14.4%.[26] Given the case-mix composition of U.S. nursing homes compared to other countries, one might have predicted a higher prevalence of antipsychotic use in the United States. Yet, policy has certainly had an impact on the prescribing of antipsychotic drugs in U.S. nursing homes.[26–28] Moreover, in the highly regulatory U.S. environment, attempts to reduce antipsychotics used as chemical restraints might have caused physicians to refrain from prescribing these agents, even for conditions in which residents may have benefited from the agents.

The pattern of antipsychotic use described in this study was generally indicative of good practice. Indeed, the prescription of antipsychotics was appropriately restricted either to psychiatric patients (7 out of 10 patients were treated) or to patients with cognitive impairment, independent from a given diagnosis of dementia, who displayed behavioral or psychotic symptoms (1 out of 5 patients were treated). Likewise, we documented that the potentially inappropriate use of antipsychotics was a limited phenomenon. Daily doses for antipsychotics were lower than the standard target dose for adult patients and were in accordance with FDA recommendations for use in elderly people. Apparently, for some conventional agents, such as loxapine, mesoridazine, molindone, perphenazine, thiothixene, and trifluoperazine, the doses prescribed were even lower than the minimum recommended in labeling.[29,30] Finally, in accordance with their pharmacokinetic profile, atypical antipsychotics were mostly administered to residents on a regular basis, whereas conventional agents were more often applied for short-term control of behavioral problems.

We found that atypical antipsychotics represent the most widely used medications for the treatment of behavioral problems and psychosis among elderly nursing home residents. We observed a 3:2 ratio between atypical and conventional antipsychotics. Newer antipsychotics appear to be replacing conventional agents in nursing homes. This trend is replicated in almost every medical setting where atypical drugs are available.[31–34] Increasingly, epidemiologic studies are documenting a series of episodes of severe toxicity linked to the use of conventional antipsychotics, with elderly people more prone to these effects.[35–37] Because of these adverse effects, physicians may be willing to prescribe atypical antipsychotics despite the absence of conclusive evidence supporting their efficacy and safety in elderly patients.

The most frequently prescribed atypical antipsychotic was risperidone, followed by olanzapine and quetiapine. Clozapine represents the smallest percentage of prescriptions. This seems reasonable given the serious risk of agranulocytosis linked to the use of this drug.[38,39] Risperidone represents the second atypical agent marketed

after clozapine. Two double-blind, placebo-controlled trials have documented the efficacy of risperidone among demented patients.[40,41] At low doses, risperidone has a superior side effect profile with respect to the risk of EPS. More recently, a double-blind, randomized, placebo-controlled trial[42] conducted among nursing home residents with Alzheimer's disease suggested the efficacy of low-dose olanzapine. Although no increase in EPS risk was observed with olanzapine, there was an increase in somnolence and gait disturbances.[42]

In the current analysis, we found that some demographic, functional, and clinical characteristics of residents were associated with atypical antipsychotic use.

Residents with higher BMI appeared to be more likely to receive atypical than conventional antipsychotics. Weight gain has been increasingly associated with the use of some atypical antipsychotics.[43] Nonetheless, the cross-sectional analysis does not allow any causal inference to be drawn regarding the observed association between atypical antipsychotic use and BMI increase.

Residents receiving conventional antipsychotics showed a higher level of functional impairment than residents taking atypical agents. We know of no studies evaluating the treatment with a specific class of antipsychotic medications and functional impairment in the geriatric population. However, Green et al.[44] found that demented patients receiving medications for the treatment of behavioral disorders showed a higher level of both functional and cognitive impairment. Interpreting our findings is particularly challenging. First, the magnitude of the estimated effect of functional status on predicting the use of a specific class of antipsychotics is low. Second, given the cross-sectional design of our study, we cannot establish a causal relationship. The observed effect could reflect either a greater impact of conventional antipsychotics on residents' functional status, or the preference of physicians to treat patients in the best physical conditions with the "best" drug available.

Residents receiving atypical antipsychotics were similar to residents receiving conventional agents with respect to the severity of behavioral disorders and level of cognitive impairment. Our findings suggest that other factors differentiate the choice of antipsychotic class. Residents with diagnoses of Parkinson's disease or depression appeared to be more likely to receive atypical rather than conventional agents. This positive association was expected given the superior side effect profile of atypical antipsychotics with regard to EPS, as well as their well-known effectiveness in treating negative symptoms.[45–47] The lower incidence of extrapyramidal side effects associated with atypical antipsychotic use might also be indirectly supported by the fact that after controlling for diagnosis of Parkinson's disease, residents taking conventional agents were more likely than atypical antipsychotic users to receive antiparkinsonian agents.

Self-pay residents were more likely and Medicare residents less likely to receive atypical than conventional antipsychotics relative to Medicaid residents. Also, residents taking antidepressants or cholinesterase inhibitors were found to be more likely to receive atypical than conventional antipsychotics, and this association remained after controlling for depression and dementia. We believe that this association may reflect the influence exerted by structural and organizational characteristics of facilities in the treatment decision-making process. Previously, we have shown that some facility structural characteristics can influence antipsychotic and antidepressant use in nursing homes.[24] We hypothesized that residents taking antidepressants or cholinesterase inhibitors were more likely to be residents of nursing homes with special units that employ mental care professionals. As such, residents in these homes may receive more adequate care for their psychiatric condition, including atypical antipsychotics for the treatment of psychosis.

This study has some limitations. The scale we used to measure behavior problems could have led to inaccurate estimates owing to misclassification. Moreover, given the cross-sectional nature of the study design, we cannot establish the temporal sequence of the associations. Therefore, the observed lack of association between the severity of psychotic symptoms and the class of antipsychotics prescribed should be interpreted cautiously. We cannot rule out the possibility that psychotic symptom severity actually reflects the effect of the current treatment. Also, we used CMS quality indicators to provide an operational expression of the level of appropriateness of antipsychotic use. While the specific clinical rationale is debatable, these definitions are the official parameters that regulators consider in the judgment of practice patterns and for Medicare certification of the facilities. Finally, we used data from only 5 states. As such, the findings from this study might not be extended to the whole U.S. nursing home population.

In conclusion, atypical antipsychotics appear to be replacing conventional agents in U.S. nursing homes. The use of these agents appears to be reasonable and cautious in terms of indications and dosages. Few sociodemographic, functional, and clinical characteristics of the residents explain the pattern of choice. The role of facility structural factors along with economic incentives and physician characteristics should be investigated. The lack of definitive scientific evidence supporting the use of atypical antipsychotics may influence the impact of such structural factors. Recently launched trials assessing the effectiveness of atypical antipsychotics for psychosis and agitation occurring in patients with dementia will resolve this issue.[48]

Drug names: chlorpromazine (Thorazine and others), clozapine (Clozaril and others), fluphenazine (Permitil, Prolixin, and others), haloperidol (Haldol and others), loxapine (Loxitane and others),

mesoridazine (Serentil), molindone (Moban), olanzapine (Zyprexa), perphenazine (Etrafon and others), prochlorperazine (Compazine and others), quetiapine (Seroquel), risperidone (Risperdal), thiothixene (Navane and others), trifluoperazine (Stelazine and others).

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