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An observational study of antipsychotic medication use among long-stay nursing home residents without qualifying diagnoses

Lorraine J. Phillips PhD, RN, FAAN, Associate Professor[1] | Nancy M. Birtley DNP, APRN, PMHCNS-BC, PMHNP-BC, Assistant Teaching Professor[2] | Gregory F. Petroski PhD, Research Assistant Professor[3] | Carol Siem MSN, RN, GNP-BC, QIPMO Clinical Educator[2] | Marilyn Rantz PhD, RN, FAAN, Curators' Professor Emerita[2]

[1]University of Delaware School of Nursing, Newark, Delaware

[2]School of Nursing, University of Missouri, Columbia, Missouri

[3]Office of Medical Research, School of Medicine, University of Missouri, Columbia, Missouri

Correspondence
Lorraine J. Phillips, University of Delaware School of Nursing, 377 McDowell Hall, Newark, DE 19716.
Email: ljphil@udel.edu

Accessible summary

What is known on the subject?

- In the United States, 15.5% of nursing home residents without qualifying diagnoses of schizophrenia, Huntington's' Disease, and/or Tourette Syndrome receive antipsychotic medications.
- Antipsychotic medications are used off-label (i.e., used in a manner the United States Food and Drug Administration's packaging insert does not specify) to treat neuropsychiatric symptoms, often before attempting nonpharmacologic interventions, despite evidence that this drug class is associated with significant adverse events including death.
- Less than optimal staffing resources and lack of access to geropsychiatric specialists are barriers to reducing antipsychotic use.

What the paper adds to existing knowledge?

- Antipsychotic use occurred in 11.6% of nursing home residents without qualifying or potentially qualifying diagnoses (bipolar disorder and psychotic disorder); antipsychotic use was more prevalent in residents with a dementia diagnosis than those without.
- One additional registered nurse hour per resident day could reduce the odds of antipsychotic use by 52% and 56% for residents with and without a dementia diagnosis respectively.

What are the implications for practice?

- Given the influence of total staffing and professional staff mix on risk of antipsychotic use, nursing home administrators may want to consider aspects of facility operation that impact antipsychotic use.
- More stringent Unites States' survey and certification standards for dementia care implemented in 2017 demand proactive person-centered care that promotes maximal well-being and functioning without risk of harm from inappropriate psychoactive medications.
- Mental health nurses have requisite training to provide expert person-centered care to nursing home residents with mental illness and geropsychiatric disorders.

Abstract

Introduction: Antipsychotic use in nursing homes varies widely across the United States; inadequate staffing, skill mix, and geropsychiatric training impede sustained improvement.

Aim: This study identified risk factors of antipsychotic use in long-stay residents lacking qualifying or potentially qualifying diagnoses.

Method: This secondary analysis used 2015 Minimum Data Set and cost report data from 458 Missouri nursing homes. The full sample (N = 29,679) was split into two subsamples: residents with (N = 15,114) and without (N = 14,565) a dementia diagnosis. Separate logistic regression models were run.

Results: Almost 15% of the dementia subsample and 8.4% of the nondementia subsample received an antipsychotic medication in the past week. Post-traumatic stress disorder, psychosis indicators, behavioral symptoms, anxiety medication with and without anxiety diagnosis, depression medication with and without depression diagnosis, and nurse staffing were among the strongest predictors of antipsychotic use in both subsamples. Simulation analyses showed decreased odds of receiving an antipsychotic in both subsamples when registered nurse hours matched the national average.

Discussion: Matching nurse staffing mix to the national average may improve antipsychotic use in nursing homes.

Implications: Knowledge of antipsychotic use risk factors use can inform care planning and staff education to minimize use of these medications in all but severe cases.

KEYWORDS

antipsychotic medication, minimum data set, nursing home

1 | INTRODUCTION

In 2017, dementias including Alzheimer's disease affected an estimated 5.5 million Americans, a figure expected to rise to 13.8 million by 2050 (Hebert, Weuve, Scherr, & Evans, 2013). Ten percent of people age 65 and older have Alzheimer's disease, with steady incremental increases reaching a rate of 32% in people age 85 and older (Alzheimer's Association, 2017; Hebert et al., 2013). Dementia is the leading cause of nursing home admission with over 30% of older adults with dementia eventually receiving nursing home care (Agüero-Torres, von Strauss, Viitanen, Winblad, & Fratiglioni, 2001; Eaker, Vierkant, & Mickel, 2002). Among nursing home residents in the United States (US), 50.4% have a diagnosis of dementia (Harris-Kojetin et al., 2016).

Persons with dementia commonly experience neuropsychiatric symptoms that may manifest as delusions, hallucinations, depressive symptoms, anxiety, euphoria, agitation, apathy, wandering, aggression, and disinhibition (Lai & Arthur, 2003; Lucero, 2002; Lyketsos et al., 2002; Selbæk, Engedal, & Bergh, 2013). These symptoms, which are distressing for persons with dementia and their caregivers, are a major factor leading to nursing home admission (Wergeland, Selbæk, Bergh, Soederhamn, & Kirkevold, 2015). Research indicates that 68%–84% of nursing home residents with dementia have at least one clinically significant neuropsychiatric symptom (Bergh & Selbæk, 2012; Selbæk et al., 2013; Zuidema, Derksen, Verhey, & Koopmans, 2007). However, many behaviors are incorrectly interpreted as neuropsychiatric symptoms. Such behaviors can result when residents experience pain, discomfort, or hunger; need to be toileted or changed; or struggle with environmental factors, such as light, noise, or temperature (Centers for Medicare and Medicaid Services, 2013; Zuidema et al., 2015). Residents suffering from undiagnosed or unstable medical conditions may exhibit neuropsychiatric symptoms from delirium (Bakker, 2003; Dewing, 2009; Lai & Arthur, 2003; Zuidema et al., 2015).

Antipsychotic medications (APMs) are frequently used off-label to treat neuropsychiatric symptoms (Maglione et al., 2011), often before attempting nonpharmacologic interventions (Fitzsimmons, Barba, Stump, & Bonner, 2014). By first identifying underlying causes of psychiatric and behavioral symptoms, then providing appropriate nonpharmacological interventions, off-label use of APMs may decline (Birtley, 2016; Richter, Meyer, Mohler, & Kopke, 2012). Moreover, providers may prescribe APMs over more appropriate

psychotropic medications despite evidence that this drug class is associated with significant adverse events including death (Ballard, Waite, & Birks, 2012; Birtley, 2016; Schneider, Dagerman, & Insel, 2005; U.S. Food and Drug Administration, 2008).

In response to evidence that using APMs to treat neuropsychiatric symptoms is associated with increased risk of stroke and death in persons with dementia (Gill et al., 2005; Schneider et al., 2005), the Centers for Medicare and Medicaid Services (2017a) created the National Partnership to Improve Dementia Care. Partnering with industry and advocacy groups, the Centers for Medicare and Medicaid Services employed three main activities to reduce antipsychotic use: Launch of the Partnership and educational resources on nonpharmacological interventions in 2012, public reporting of each home's use of APMs in 2012, and revision of federal survey and certification standards for dementia care and APM use, coupled with enhanced training for surveyors in 2013 (Lucas & Bowblis, 2017). Through the Minimum Data Set – a federally mandated health assessment instrument completed quarterly on nursing home residents – aggregate data at the facility level on recent use of APMs is captured (Centers for Medicare and Medicaid Services, 2017b). In May 2012, at the start of the Partnership, 23.9% of the nation's long-stay residents *without* a qualifying diagnosis of schizophrenia, Huntington's disease, and/or Tourette syndrome had an APM prescribed; in 2017, the average prevalence of APM use was 15.5%, a 35% decrease since 2012 (Centers for Medicare & Medicaid Services, 2017a). Prevalence rates have declined because of these concerted strategies (Lucas & Bowblis, 2017), however, the range of use across states- from 6.8% in Hawaii to 19.8% in Kansas - indicates needs for ongoing surveillance and greater understanding of factors associated with APM use in residents lacking a qualifying diagnosis. Regional differences, however, in survey practices may affect deficiency reporting, resulting in more or less motivation to decrease APM use (Harrington, Carrillo, Blank, & O'Brian, 2010).

Prior research has identified resident and facility characteristics commonly associated with APM use. Residents who have been prescribed APMs tend to be younger and less frail, have behavioral problems, need more assistance with activities of daily living (ADLs), and have a diagnosis of dementia or psychosis (Chen et al., 2010; Gellad et al., 2012; Kamble, Chen, Sherer, & Aparasu, 2009; Petek Šter & Cedilnik Gorup, 2011). Of note, APMs may be permitted for residents with conditions other than dementia (e.g., bipolar disorder, psychosis in the absence of dementia, hiccups), provided documentation in the medical record supports their use (Centers for Medicare and Medicaid Services, 2013). Residents prescribed antidepressants, anxiolytics, hypnotics, and/or dementia drugs were also more likely to be prescribed an APM (Gellad et al., 2012; Petek Šter & Cedilnik Gorup, 2011). A recent systematic review of 19 studies found that higher APM use was associated with smaller facility size, for-profit status, metropolitan location, and lower registered nurse staffing level (Cioltan et al., 2017). Interestingly, one study in the former review reported that higher registered nurse and certified nursing assistant staffing, but not licensed practical nurse staffing, was associated with lower APM use (Lucas et al., 2014).

Five years after launching the National Partnership to Improve Dementia Care, substantial variation in APM use persisted among regions, states, and individual facilities (Gurwitz, Bonner, & Berwick, 2017). Intensive and sustained educational programs and in-reach services provide the strongest evidence of effectiveness in reducing APM use (Brooker et al., 2016; Fossey et al., 2006; Gordon et al., 2016; Patterson, Hughes, Crealey, Cardwell, & Lapane, 2010). However, inadequate staffing, rapid staff turnover, and lack of access to geropsychiatric specialists are substantial barriers to implementing and sustaining these interventions in nursing homes, importantly in the US where direct care staff turnover averages 50% (American Health Care Association, 2014; Coon et al., 2014). Although minimal staffing levels are critical to quality of care, professional staff mix may exert more influence on APM use than total nurse staffing levels (Harrington, Schnelle, McGregor, & Simmons, 2016). Therefore, we aimed to identify resident and nursing home risk factors of APM use within dementia and nondementia populations, the knowledge of which could help homes provide more focused staff education, proactively plan individualized nonpharmacologic interventions, and configure staffing to minimize APM use in at-risk residents. Using secondary data sources, we

1. Examined the prevalence of APM use in two samples of long-stay nursing home residents (with and without a dementia diagnosis) who lacked a qualifying diagnosis for APM use or did not have a Minimum Data Set-recorded diagnosis of bipolar disorder or psychotic disorder, the latter of which were labeled *potentially qualifying* diagnoses in the present study and

2. Identified nursing home (profit status, size, staffing ratio by level of preparation, and location) and resident (demographic characteristics, neuropsychiatric symptoms, medical diagnoses, medications, ability to communicate, cognitive patterns, mood, delirium, functional status, pain, and bowel and bladder function) characteristics associated with APM use.

Although similar studies have been conducted, few studies included this range of resident characteristics within the context of staffing levels and professional staff mix. The analyses presented here corroborate and expand on existing knowledge about APM use in long-stay nursing home residents. Our report complies with **STROBE** reporting guidelines for cross-sectional studies (https://www.strobe-statement.org/index.php?id=available-checklists).

2 | METHODS

2.1 | Study design and setting

This was a retrospective secondary analysis of Minimum Data Set 3.0 and cost report data collected from 458 Medicare or Medicaid certified nursing homes in Missouri in 2015. A Data Use Agreement between the Centers for Medicare and Medicaid and the University of Missouri provided access to Missouri Minimum Data Set and cost report data. The University of Missouri Health Sciences Institutional

Review Board approved the study (Project number: 2005550) as exempt from full board review because only de-identified data previously collected by the Missouri Department of Health and Human Services were analyzed.

2.2 | Inclusion criteria

The sample included long-stay residents, defined as those having an annual or quarterly Minimum Data Set assessment, in 2015. Residents with only an admission assessment, i.e., admission period less than 90 days, were excluded. We excluded persons who were under age 18, in a hospital-based facility, comatose, or had a diagnosis of schizophrenia, Huntington's disease, Tourette syndrome, bipolar disorder, and/or psychotic disorder documented in the Minimum Data Set as these represent conditions for which APMs may be appropriate. In preparation for separate analyses, the sample was split into two subsamples corresponding to residents with a diagnosis of dementia and without a diagnosis of dementia. Dementia was defined as being positive for Minimum Data Set items I4200 (Alzheimer's Disease) or I4800 (non-Alzheimer's Dementia).

2.3 | Data sources

Data for the resident-level analyses were obtained from residents' most recent Minimum Data Set assessment – annual assessment, quarterly assessment, significant change subsequent to an annual or quarterly assessment, or correction to an annual or quarterly assessment – completed between January 1, 2015 and December 31, 2015. Each type of assessment included all study variables; the significant change assessment is used for residents with significant health status changes between quarterly assessments, and the correction assessment is used in the case of an error on the last assessment. Facility-level variables were extracted from the annual cost report data that all certified nursing homes are required to submit to the Missouri Department of Health and Senior Services. For staffing data in particular, data from state cost reports are considered more accurate than data from the federal Online Survey Certification And Reporting/Certification and Survey Provider Enhanced Reporting systems that reflect staffing levels for just the 2-week period prior to the state survey (Kash, Hawes, & Phillips, 2007).

2.4 | Outcome variable

Minimum Data Set item N0410A (Medications Received, Antipsychotic) documents the number of days in the last seven that a resident received an APM. The outcome for this study was coded as a 1 when an APM was used at least once in the past 7 days and as a 0 if there was no use in the past 7 days.

2.5 | Independent variables

We selected several resident characteristics from the most recent assessment to predict APM use. The structured response format of the Minimum Data Set guided the coding scheme of study variables. Demographic characteristics included age, gender, marital status (never married, married, widowed, separated/divorced), race (black or African American, white, other) and Hispanic/Latino ethnicity (yes, no). Hearing, speech, and communication variables were dichotomously coded for the presence or absence of a problem. The vision variable was coded as unimpaired for ratings reflecting at least minimal ability to identify objects (i.e., adequate, impaired, or moderately impaired), and impaired for visual ability ranging from inability to identify objects to no vision (i.e., highly impaired or severely impaired). Cognitive patterns were assessed by the Brief Interview for Mental Status (BIMS) score, or as an alternative to missing data for residents unable to complete the BIMS, the Cognitive Performance Scale (CPS) score was substituted using specified Minimum Data Set 3.0 items (Morris et al., 1994). We used validated categories of cognitively intact (BIMS score of 13–15; CPS score of 0–1), moderately impaired (BIMS score of 8–12; CPS score of 2–4), and severely impaired (BIMS score of 0–7; CPS score of 5–6) for both scales (Centers for Medicare & Medicaid Services, 2017b; Saliba & Buchanan, 2008). We used the Minimum Data Set mood score (range 0–27) as an indicator of depressive symptoms. Residents were classified as having delirium if inattention, disorganized thinking, altered level of consciousness, and/or psychomotor retardation were present and fluctuated, i.e., changed in frequency and/or severity. Psychosis was dichotomously coded according to the presence or absence of hallucinations and/or delusions. Behavioral symptoms dichotomously coded included physical behavioral symptoms directed toward others, verbal behavioral symptoms directed toward others, other behavior symptoms not directed toward others (e.g., hitting or scratching self, rummaging, pacing, sexual acts etc.), rejection of care, and/or wandering. Late-loss ADLs items (bed mobility, transfer, eating, toilet use) were coded from 0 (total independence) to 4 (total dependence), then summed (range 0–16) (Wysocki, Thomas, & Mor, 2015). Both bladder and bowel function were classified as incontinent if frequently incontinent and always incontinent were recorded. Selected diagnoses that may have influenced antipsychotic use (multiple sclerosis, traumatic brain injury, anxiety, depression, post-traumatic stress disorder) were coded as present or absent. Pain was coded as present if it occurred almost constantly or frequently, and absent if no pain or less frequent pain was recorded. The use of antianxiety, antidepressant, and hypnotic agents at least once in the past 7 days was coded as present or absent.

Facility size was categorized into three groups: small (fewer than 60 certified beds), medium (60–119 beds), and large (120 or more beds). A dichotomous variable coded nonprofit and government nursing homes as 0 and for-profit homes as 1. Adopting the approach of Sawyer, Lillis, Bodner, and Allman (2007), we characterized population size of the counties where the facilities were located as being less than the 50th percentile, between the 50th and 75th percentile, and greater than the 75th percentile.

Registered nurse, licensed vocational/licensed practical nurse, and certified nursing assistant staffing were each expressed as hours per resident day. The statewide distribution of each staffing variable was examined using summary statistics and histograms. Facilities reporting any one of the staffing values below the 1st percentile or above the 99th percentile were excluded from the analysis. Data from 458 of 503 Missouri facilities were used. The data quality procedure is similar to that used by Harrington, Carrillo and Garfield (2017).

2.6 | Data analysis

SAS/STAT® v9.4. was used for data analysis. We computed descriptive statistics as appropriate to a given variable for the dementia and nondementia samples. Logistic regression with stepwise variable (Hosmer & Lemeshow, 1989, Section 4.3) selection was used to cull the pool of potential resident-level predictors. The significance level for a variable to enter the model was set at 0.05 and because the sample sizes were large, significance to remain in the model was set at 0.01.

The assumption that the logit is linear in the ordinal independent variables (late loss ADLs and mood scores) was checked by plotting the empirical logit against the ordered categories. The plots indicated a linear fit for the mood score but not for late-loss ADLs; the plot of the latter variable indicated that the probability of receiving an APM increased with the ADL score but then flattened at the score of 8. A spline model for age indicated that the probability of receiving an APM increased until age 80 and declined thereafter. Thus, mood score entered the model as a continuous variable whereas late-loss ADLs and age variables were dichotomized at <8 and <80, respectively. In the variable selection step, categorical variables with more than two levels were maintained in their whole form, i.e. treated as single multicategory variables, as opposed to forming multiple indicators representing separate categories.

Because stepwise methods do not make full use of the nested data structure of residents within facilities, the variables identified by the stepwise process were used to refit a random-intercept logistic model with facility as the random effect. The statistical modeling steps were carried out separately for the dementia and nondementia samples. Following the creation of the resident-level models, facility and county level covariates were added to the model and those with $p < 0.05$ were included in the final model. Post hoc analyses examined the hypothetical effect on odds of APM use if registered nurse hours in Missouri nursing homes were raised to the US average. Regression results are presented as odds ratios (ORs) with 95% confidence intervals (CIs).

3 | RESULTS

From among 51,733 short- or long-stay residents in Missouri nursing homes in 2015, 29,679 individuals both met inclusion criteria and resided in a home with usable staffing data. Descriptive statistics of the nondementia (N = 14,565) and dementia (N = 15,114) subsamples are presented in Table 1 and for the nursing homes are presented in Table 2. Of the 29,679 residents included in the analysis, 3,456 (11.6%) had received an APM in the last 7 days. Among the dementia sample, 14.8% had received an APM in the past 7 days compared to 8.4% of the nondementia sample. Residents with a dementia diagnosis had 89% higher odds of receiving an APM than residents without a dementia diagnosis (OR = 1.89; 95% CI [1.69, 2.11]). With adjustment for the resident-level factors in Table 3, the OR associated with dementia was 2.03 with 95% CI from 1.83 to 2.24.

Most homes were for profit, between 6–120 certified beds in size, and were in counties in the highest quartile of population. Total nursing hours per resident day (hereinafter labeled hour or hours) averaged 3.67 compared to the US average in 2015 of 4.1 (Harrington et al., 2017). The largest portion of that difference was due to fewer registered nurse hours in Missouri (0.45 hr), which is 0.35 hr less than the US average of 0.80 hr (Harrington et al., 2017).

Table 3 displays statistically significant variables identified in the final logistic regression models predicting APM use for the dementia and nondementia samples. Many resident-level factors that independently correlated with APM use were similar for both samples: male gender, age < 80 years, score less than eight on late-loss ADLs (i.e., less dependent), presence of delirium, greater cognitive impairment, presence of psychosis indicators, presence of behavioral symptoms, post-traumatic stress disorder diagnosis, diagnoses for anxiety and depression absent medication, the use of antidepressants and antianxiety medications absent a diagnosis, and also when diagnoses were accompanied by appropriate medications. In both samples, a diagnosis of post-traumatic stress disorder had the strongest association with APM use. In the dementia sample, wandering was associated with increased odds of APM use. In the nondementia sample, mood symptoms were associated with higher odds of APM use.

Nursing home characteristics associated with APM use varied by sample. In the dementia sample, the odds of APM use would be reduced 52% [(1–0.48)*100] for each additional hour of registered nurse time. Odds of APM use were higher in the least populated counties. In the nondementia sample, each additional hour of registered nurse time reduced the odds of APM use by 56% [(1–0.44)*100] and each hour of certified nursing assistant time reduced the odds of APM use by 21% [(1–0.79)*100]. These results suggest that if Missouri nursing homes met the US average of 0.8 registered nurse hours, the average effect of adding 0.35 hr of registered nurse time would be a 22% reduction in the odds of inappropriate APM use with dementia residents. Similarly, for the nondementia population, the addition of 0.35 hr of registered nurse time would result in a 25% reduction in the odds of APM use. In other words, if Missouri homes increased registered nurse hours to reach the US average, the odds of receiving an APM would be less for both groups of residents.

The models demonstrated moderate discriminatory power (Fan, Upadhye, & Worster, 2006). For the random intercept models with covariates, the receiver operator characteristic curve area for the dementia model was 0.79 (95% CI: 0.78, 0.80) and for the nondementia model, the area was 0.83 (0.82, 0.84).

TABLE 1 Descriptive characteristics of the nondementia and dementia samples

Resident characteristics	Nondementia sample (n = 14,565)	Dementia sample (n = 15,114)
Gender, % Female	63.07	73.29
Age in years, mean (SD)	76.53 (14.7)	84.67 (9.35)
Age, % less than 80 years	50.97	23.96
Hispanic or Latino, %	0.43	0.46
Race, %		
Caucasian	87.66	89.48
Black	11.86	10.08
Other	0.48	0.44
Marital, %		
Never married	20.19	7.75
Married	18.39	21.83
Widowed	43.60	59.27
Separated/divorced	17.81	11.16
Hearing (ability to hear), %	27.52	38.58
Speech (ability to speak clearly), %	13.52	18.96
Ability to make self understood, %	21.86	47.24
Ability to understand, %	7.25	26.43
Vision (ability to see), %	3.94	5.78
Cognitive patterns, %		
Cognitively intact	54.88	14.26
Moderately impaired	24.41	23.96
Severely impaired	20.70	61.78
Mood score, mean (SD)	2.11 (3.17)	2.35 (3.36)
Presence of delirium, %	12.67	30.19
Presence of psychosis indicators, %	3.14	10.02
Presence of behavioral symptoms, %	6.99	13.90
Rejection of care, %	5.66	9.87
Wandering, %	1.63	10.18

(Continues)

TABLE 1 (Continued)

Resident characteristics	Nondementia sample (n = 14,565)	Dementia sample (n = 15,114)
Late-loss ADLs < 8, %	45.62	35.20
Urinary incontinence, %	41.57	64.69
Bowel incontinence, %	31.32	50.09
Diagnoses, %		
Anxiety disorder	28.06	33.30
Depression	48.86	56.34
Multiple sclerosis	2.11	0.69
Post-traumatic stress disorder	0.45	0.28
Traumatic brain injury	1.25	0.52
Presence of pain, %	16.86	7.32
Medication received, %		
Antianxiety	22.5	22.17
Antidepressant	56.87	56.88
Antipsychotic	8.40	14.77
Hypnotic	4.85	1.79

Note. ADLs, activities of daily living; SD, standard deviation.

TABLE 2 Descriptive characteristics of the nursing homes (N = 458)

Nursing home characteristics	Frequency (%) or Mean (SD)
Finance type	
For profit, %	73.8
Not-for-profit and government, %	26.2
Number of certified beds	
Less than 60, %	8.53
60–120, %	52.95
Greater than 120, %	38.51
Number of residents per facility, mean (SD)	65 (34)
County population by quartile, %	
Lower than 50th percentile	22.49
50th–75th percentile	20.52
Greater than 75th percentile	56.99
Registered nurse hours per resident day, mean (SD)	0.45 (0.20)
Licensed vocational/licensed practical nurse hours per resident day, mean (SD)	0.76 (0.25)
Certified nursing assistant hours per resident day, mean (SD)	2.46 (0.47)
Residents within nursing homes receiving an APM, mean percent (SD)	13 (10)

Note. APM, antipsychotic medication; SD, standard deviation.

TABLE 3 Final logistic regression models predicting antipsychotic medication use for nondementia and dementia samples

Predictor	Non-dementia model		Dementia model	
	OR (CI)	p	OR (CI)	p
Male gender	1.26 (1.10, 1.45)	0.0008	1.42 (1.27, 1.58)	<0.0001
Age < 80 years	2.07 (1.78, 2.41)	<0.0001	1.70 (1.52, 1.90)	<0.0001
Presence of delirium	1.60 (1.32, 1.93)	<0.0001	1.31 (1.17, 1.47)	<0.0001
Cognitive pattern: moderate impairment[a]	1.33 (1.12, 1.57)	0.001	1.16 (0.97, 1.39)	0.0956
Cognitive pattern: severe impairment[a]	1.65 (1.37, 1.98)	<0.0001	1.30 (1.10, 1.53)	0.0023
Mood symptoms	1.03 (1.01, 1.05)	0.003		
Presence of psychosis indicators	2.68 (2.04, 3.53)	<0.0001	1.87 (1.61, 2.18)	<0.0001
Presence of behavioral symptoms	2.09 (1.73, 2.54)	<0.0001	1.91 (1.67, 2.17)	<0.0001
Wandering			1.73 (1.50, 2.01)	<0.0001
Late-loss ADLs< 8	1.32 (1.15, 1.52)	<0.0001	1.23 (1.10, 1.37)	0.0002
Post-traumatic stress disorder	3.97 (2.19, 7.21)	<0.0001	5.89 (2.92, 11.87)	<0.0001
Anxiety diagnosis without medication	1.62 (1.32, 1.99)	<0.0001	1.69 (1.47, 1.93)	<0.0001
Anxiety medication without diagnosis	2.53 (2.06, 3.12)	<0.0001	2.03 (1.69, 2.45)	<0.0001
Anxiety diagnosis with medication	2.28 (1.92, 2.71)	<0.0001	2.13 (1.86, 2.43)	<0.0001
Depression diagnosis without medication	1.69 (1.25, 2.27)	0.0006	1.42 (1.18, 1.70)	0.0002
Depression medication without diagnosis	2.80 (2.28, 3.44)	<0.0001	1.92 (1.63, 2.27)	<0.0001
Depression diagnosis with medication	2.43 (0.37, 0.73)	<0.0001	1.62 (1.43, 1.84)	<0.0001
Registered nurse hours per resident day	0.44 (0.26, 0.75)	0.0024	0.48 (0.31, 0.75)	0.0013
Certified nursing assistant hours per resident day	0.78 (0.62, 0.96)	0.0223		
County population: less than 50th percentile[b]			1.36 (1.09, 1.68)	0.0055
County Population: 50th–75th percentile[b]			1.26 (1.02, 1.57)	0.0356

Notes. ADLs, activities of daily living; CI, confidence interval; OR, Odds ratio.
[a]Intact cognitive function is the reference. [b]County population greater than 75th percentile is the reference.

4 | DISCUSSION

In this representative sample of nursing home residents who lacked a qualifying or potentially qualifying diagnosis justifying APM use, almost 12% received this class of medication. Although the Partnership reported a higher rate of APM use in Missouri during the last quarter of 2015 (i.e., 19.2%), our sampling procedures

– excluding residents with the *potentially qualifying* diagnoses of bipolar disorder and psychotic disorder – likely lowered the rate of APM use in this study. Considering that persons with dementia have increased mortality when treated with APMs (U.S. Food and Drug Administration, 2008), it is concerning that almost 15% of residents with dementia in Missouri nursing homes in 2015 received these medicines, perhaps inappropriately. Missouri has

consistently ranked in the highest quintile of APM use nationally, comparing similarly to several other Midwestern and southern states (Centers for Medicare & Medicaid Services, 2017a). The present study identified shared and unique predictors of APM use in residents with and without dementia; first we discuss resident and facility predictors that were common to both subsamples, then predictors unique to each subsample

Not surprisingly, the presence of psychosis was a predictor of APM use in both the dementia and nondementia samples. Unlike schizophrenia and other psychotic disorders, little evidence suggests that psychosis in dementia results from increased dopamine synthesis and dopamine receptors, which is the basis for treatment with APMs (Ravona-Springer & Davidson, 2014). What may be considered delusion in a schizophrenic may be confabulation in a person with dementia (Mendez, Fras, Kremen, & Tsai, 2011). Yet, in many cases of dementia, providers may misdiagnose confusion as delusion, and illusion as hallucination. For example, persons with dementia often misplace or hide items, such as a wallet, for safekeeping and then forget doing this, later accusing someone of stealing this item. This is frequently interpreted as delusion but is confusion. Individuals with dementia have difficulty separating fiction from reality and so may believe that what they dreamed or saw on television is true. It is important that caregivers of nursing home residents with dementia evaluate whether the symptom is truly psychosis or confusion, because antipsychotic medications are not appropriate for treating confusion (Centers for Medicare and Medicaid Services, 2013).

Delirium was a predictor of inappropriate APM use in residents with and without dementia. APMs may be appropriate for treatment of delirium in some settings, such as the intensive care unit (National Guideline Clearinghouse, 2013a). However, the American Medical Directors Association's guideline cautions against prescribing APMs and other psychotropic medications for delirium in the long-term care setting (National Guideline Clearinghouse, 2008).

The presence of a diagnosis of anxiety disorder or depression raised the odds of receiving an APM, as did the current use of an antidepressant or antianxiety agent, with or without a diagnosis. Anxiety is a common neuropsychiatric symptom among nursing home residents, and our analyses show that anxiety is associated with APM use in both subsamples. Symptoms of anxiety, such as restlessness, fatigue, and poor concentration are also symptoms of dementia in the absence of an anxiety disorder (Seignourel, Kunik, Snow, Wilson, & Stanley, 2008). Providers may find it difficult to ascertain subjective symptoms of anxiety, such as excessive worry, in persons with dementia, making it challenging to diagnose an anxiety disorder (Seignourel et al., 2008). Although few studies target nonpharmacological approaches to managing anxiety in dementia, the literature suggests benefit from therapeutic touch, music therapy, aromatherapy, pet therapy, simulated interaction, validation therapy, cognitive stimulation therapy, structured recreational activities, and access to the outdoors (Cohen-Mansfield, 2001; Livingston, Johnston, Katona, Paton, & Lyketsos, 2005). Additionally, many nursing home residents have a depression diagnosis, although not all receive antidepressant therapy and most receive no behavioral therapy (Levin et al.,

2007). As a further complication, response to treatment with antidepressants in late-life depression is modest and variable (Nelson, Delucchi, & Schneider, 2008). Consequently, the concurrent use of multiple psychotropic drugs may relate to augmentation stemming from lack of clinical response to one medication, difficulty in differentiating psychiatric diagnoses from dementia, misunderstanding the biological mechanisms associated with the symptoms, multifactorial symptomatology, and caregiver expectations (Ravona-Springer & Davidson, 2014). Meta-analytic findings support APM discontinuation in persons with dementia, with the caveat that withdrawal may not be recommended or be successful in persons with severe neuropsychiatric symptoms (Declercq et al., 2013).

Although this study included a small number of post-traumatic stress disorder cases, this diagnosis was strongly associated with the inappropriate use of APMs in both subsamples. The National Guideline Clearinghouse (2013b) and National Institute for Health and Care Excellence (2005) stress that APMs are not recommended as first-line treatment of post-traumatic stress disorder. They add that the treatment of choice is trauma-focused cognitive behavioral therapy or eye movement desensitization and reprocessing followed by antidepressants. The dearth of psychological services in nursing facilities and poor reimbursement limits the availability of these services.

Wandering, a particularly challenging neuropsychiatric symptom of dementia, predicted APM use only in the dementia subsample. Wanderers are often prescribed APMs, even though the medications may increase this behavior and, according to the Centers for Medicare & Medicaid Services (2013), are not permitted unless certain criteria are met, such as when behavioral symptoms present a danger to self or others and are due to mania or psychosis and/or behavioral interventions have been attempted. Persons with dementia wander for many reasons: as an expression of needs; to find something familiar in a confusing environment; to find an exit; for self-stimulation; to follow another wanderer or staff member; and as a result of akathisia, an extrapyramidal side effect of APMs (Lai & Arthur, 2003). As wandering may be beneficial as a form of exercise that enhances circulation and musculoskeletal health, nursing homes should offer a safe place with adequate space for wandering (Cohen-Mansfield, Werner, Marx, & Freedman, 1991). Engaging residents in meaningful, real-life activities after meals and distracting them with scheduled recreational activities at change of shift can help to diminish residents' exit-seeking as a natural response to lifetime habits, such as returning to work after lunch or home at the end of a shift (Lucero, 2002).

The importance of registered nurse staffing in nursing homes cannot be overstated. A 2001 study established minimum hours for registered nurses (0.75 hr), licensed vocational/licensed practical nurses (0.55 hr) and certified nursing assistants (2.8 hr), for a total of 4.1 (Centers for Medicare and Medicaid Services, 2001). In the United States in 2015, the total average hours of 4.0 included registered nurses at 0.8, licensed vocational/licensed practical nurses at 0.8, and certified nursing assistants at 2.4 (Harrington et al., 2017). Compared to recommendations and averages, Missouri falls

short in total nursing hours (3.6) as well as in hours for registered nurses (0.42) and certified nursing assistants (2.44). That Missouri's licensed vocational/licensed practical nurse hours exceeded the recommended minimum may reflect nursing homes' efforts to meet licensed nurse staffing standards most economically. Although higher registered nurse hours were associated with lower odds of APM use in both subsamples, higher certified nursing assistant hours were related to lower odds of APM use only in the nondementia sample. An early study of 14,631 US facilities also found an association between fewer certified nursing assistants per 100 beds and increased use of APMs (Hughes, Lapane, & Mor, 2000). Higher certified nursing assistant hours may allow staff time to provide pleasant activities to promote positive affect and minimize neuropsychiatric symptoms in residents without dementia but with other mental health conditions. Another study of 18 Wisconsin nursing homes found lower APM use in homes with higher nurse-to-resident staffing ratios, resident-centered culture, and lower proportion of residents with serious mental disorders (Svarstad, Mount, & Bigelow, 2001).

CMS mandates that nonpharmacological interventions be initiated prior to prescribing psychotropic medications (Centers for Medicare and Medicaid Services, 2017c). Nursing homes must track gradual dose reductions of APMs and are subject to deficiency citations for unnecessary use of psychotropic drugs (F758), including antipsychotic, anti-depressant, anti-anxiety, and hypnotic medications (Centers for Medicare and Medicaid Services, 2017d). Nursing home quality measures (e.g., the percentage of long-stay residents who received an APM and the percentage of long-stay residents who received and antianxiety or hypnotic medication) not only provide data for quality improvement efforts but also are publicly reported for consumers' use in choosing a facility (Centers for Medicare & Medicaid Services, 2017c). Our finding that being in the upper quartile of population size was associated with lower APM use in the dementia sample could indicate that market competition may incentivize homes to reduce APM use as a quality improvement measure. Tawiah, Black, Scott-Walker, Johnson, and Vaughan (2016) 2-week quality improvement initiative rooted in culture change values saw a reduction in APM use from 18% at baseline to 5% at the 3-month follow-up. Planning meetings with facility administrators and staff facilitated the program's successful implementation and ultimately reduced APM use at least in the short-term.

4.1 | Implications for mental health nursing

Mental health nurses are positioned to assist nursing homes in reducing APMs through proactive, evidence-based, and individualized nonpharmacological interventions. When nonpharmacological interventions are unsuccessful and pharmacological interventions are deemed necessary, providers can avoid APMs by choosing the safest and most effective drug first and maximizing that dose before changing or adding another medication (Birtley, 2016). APMs pose a significant risk to elderly persons with dementia and should be reserved for treating valid psychosis, which may cause significant distress, poor quality of life, and danger to

self and others (Birtley, 2016; Ravona-Springer & Davidson, 2014). In cases which an APM is appropriately prescribed, the lowest effective dose should be used, and the drug should be tapered and discontinued as soon as possible. APMs are not appropriate for treating anxiety, wandering, resisting care, restlessness, crying, or insomnia (Birtley, 2016). If APMs are necessary, there must be detailed documentation of target behaviors and/or psychiatric diagnosis for which treatment was necessary, of unsuccessful alternate interventions, and that the behaviors have significantly affected the individual's quality of life (Centers for Medicare and Medicaid Services, 2013).

4.2 | What the study adds to the existing evidence

Our findings concur with prior observational research showing that higher registered nurse staffing (Lucas et al., 2014) or licensed nurse staffing (Svarstad et al., 2001) is associated with lower odds of APM use. We know of no experimental studies that have manipulated registered nurse hours, although Lin (2014), using instrumental variables to examine the impact of legislative staffing mandates on change in nursing home deficiencies across eight states, affirms a causal and positive relationship between registered nurse staffing and quality of care. By simulating the effect of RN hours to match the national average in 2015, we demonstrated that higher RN staffing substantially reduced the odds of APM use in a representative sample of nursing home residents who lacked qualifying diagnoses as well as other diagnoses for which APM may be appropriate.

4.3 | Limitations

Our study has several notable limitations. The quality of Minimum Data Set data can be affected not only by the accuracy with which data were collected and recorded but also by the clinical insight and judgment of informants in the assessment process. Delegating authority to complete the assessment to nurses removed from patient care may result in data that do not represent residents' real status, particularly with regard to symptoms and behaviors (Hendrix, Sakauye, Karabatsos, & Daigle, 2003). We assumed that any resident given the clinical diagnosis schizophrenia, Huntington's Disease, Tourette Syndrome, bipolar disorder, and/or psychotic disorder was correctly diagnosed. If this were not the case, then these residents were unnecessarily removed from our dataset. Alternatively, residents included in our analyses may have had qualifying or potentially qualifying diagnoses for APM use not reported in the medical record. We also assumed that the presence or absence of a dementia diagnosis was accurate, which may not be true for some residents in the nondementia sample. Also, because the Minimum Data Set look-back period for APM use was limited to 7 days, recent use of an APM beyond 7 days may have diminished symptoms, thereby attenuating the ORs for some predictors of APM use. The effect of other medications that may have affected APM use, such as mood stabilizers,

anti-dementia agents, and anti-convulsants, could not be identified because they are not recorded in the Minimum Data Set. Finally, statistically significant predictors of APM use may not have an equivalent magnitude of clinical relevance due to the inherent power in large sample analyses. As a population-based study, however, this study's findings represent a large number of nursing home residents.

5 | CONCLUSION

Nursing homes must work to reduce APM use, primarily for residents' health, but also for certification and survey outcomes. While a complex issue, states could begin by realigning staffing standards to recommended minimums across all levels of licensure. Future research on use of nonpharmacological interventions could first identify which interventions work best according to individual symptoms, diagnoses, and behaviors, and second, determine effective implementation processes, including training, for management and staff.

6 | RELEVANCE STATEMENT

As nursing homes strive to reduce antipsychotic use, this study's findings can alert nurses and other health care professionals to risk factors for inappropriate APM use and prompt proactively planning of need-based interventions. Nurses working in long-term care are advised to incorporate professional resources (e.g., Clinical Practice Guidelines) into the plan of care for residents with clinical conditions or diagnoses associated with inappropriate APM use. By implementing evidence-based nonpharmacological techniques for wandering and other behavioral symptoms, APM use may be reduced, thereby mitigating harm caused by medication of side effects and by complying with regulatory mandates.

ORCID

Lorraine J. Phillips http://orcid.org/0000-0001-7154-2745

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