

Supplementary Material. Variable Descriptions

Medication Use

Each psychoactive medication type (antipsychotic, antianxiety, and antidepressant) was individually evaluated. Medication use was dichotomized as used or did not use medication in the last seven days. Analyses of change in medication use over time were limited to residents who ever received the medication during the study because most residents never received psychoactive medications and, if they had been included in the analysis, their large numbers could obscure changes over time among those who did take medications. Further, analysis of antipsychotics was limited to residents with dementia but who were not diagnosed with bipolar disorder, Tourette's syndrome, or schizophrenia.

Cognitive Skills

Cognitive impairment was assessed through the Brief Interview for Mental Status (BIMS)¹⁴ for residents who agreed to answer questions, but otherwise was assessed using or Cognitive Function Skill (CFS) ratings.^{15,16} Staff are instructed to conduct the BIMS if possible. If BIMS is not possible or the resident refuses, cognitive skills are to be assessed using the CFS ratings. Some residents in the study had values for both metrics.

There is no standard, published way to combine these 2 metrics, although both are validated tools.¹³ We created a combined cognitive skill score as follows. BIMS scores of 13–15 are categorized as intact/mild impairment, 8–12 as moderate impairment, and 0–7 as severe impairment. CFS ratings are 0: independent, 1: modified independence, 2: moderately impaired, and 3: severely impaired. We dichotomized BIMS and CFS scores into intact/mild impairment (BIMS 13–15; CFS score of 0 or 1) and moderate/severe impairment (BIMS <13; CFS score of 2 or 3). For each resident, if a BIMS score was available it was used. If a BIMS score was not available, otherwise, the CFS score was used. We modeled the change in the odds of residents having moderate or severe cognitive impairment vs none or mild impairment. All residents were used in this analysis because it was necessary to identify the cognitive status of each resident as at baseline and change over time.

Aggressive Behavior

The aggressive behavior score (ABS) is a discrete section of MDS 3.0, is a valid and reliable tool¹⁷ and is comprised of 4 components measuring verbal and physical abuse, socially inappropriate behavior, and resisting care. Residents receive a score of 0 to 3 for each

component and the sum for a total score (max of 12). Higher numbers indicate more aggressive behaviors. The ABS score was dichotomized as exhibited any aggressive behaviors versus showing no aggressive behaviors. As was done for medication use, the analysis was restricted to residents who ever showed aggressive behaviors.

PHQ-9 Mood Scores

Mood and depression were scored using the PHQ-9 survey. This validated survey is completed by the resident if the resident is verbal and capable of answering the questions or an alternate survey, PHQ-9-OV, is completed by the staff based on observed behavior.¹⁸ Although the resident completed and staff completed surveys were on slightly different scales (resident 0–27 and staff 0–30), no residents had scores above 17 and cut-offs for depressive groups were the same for values less than 20. Thus, the 2 scores could be combined. If a resident-reported PHQ-9 value was available it was used, otherwise the staff reported value was used. A logistic mixed-effect model was used to evaluate changes in the odds of any depressive symptoms (PHQ-9 >0) vs no depressive symptoms. The analysis was restricted to residents ever reporting depressive symptoms.

Pain

The presence of pain was the focus of analysis rather than the intensity and frequency of pain. For each resident, the presence of pain was determined based on self-reported information or staff observations if available or observed behaviors indicative of pain. Where available, self-reported presence or absence of pain was used. If self-reported pain information was not available, staff observations of pain behaviors were used. Pain was assumed to be present if there were any observed pain behaviors reported. The analysis was restricted to residents ever reporting pain.

Falls

For each quarter, the number of falls each resident suffered that resulted in no injury, in a nonmajor injury or a major injury was reported. To evaluate change in falls, falls were dichotomized into present or absent based on the reported number of falls, or if the number of falls was missing, the reported occurrence of a fall was used. Unlike the other outcomes, falls were modeled at the facility level. The total number of residents experiencing a fall each quarter and the number of residents were calculated and a mixed-effect logistic regression model was used to model the change in the log odds of a fall over time. A random intercept for each facility was included.

Supplementary Table 1

Number of Quarters of Data for Residents With One or More Quarters of Reported M&M Use in the Previous 7 Days

Number of Quarters	# Residents (Percentage)
0 quarters	1034 (28)
1 quarter	1057 (29)
2 quarters	666 (18)
3 quarters	509 (14)
4 quarters	254 (7)
5 quarters	146 (4)
6 quarters	9 (6)
7 quarters	104 (4)
8 quarters	56 (2)
9 quarters	38 (1)

Supplementary Table 2

Estimated Number and Percentage of Residents Exhibiting Trait Over Time

Across All Facilities Direct Estimate of the Percentages of Residents Exhibiting the Trait Each Quarter and the Number of Residents Present with Data				
	Baseline	Quarter 4	Quarter 6	Quarter 8
Antipsychotics	82.6 (n = 1018)	73.7 (n = 262)	53.8 (n = 52)	48.1 (n = 27)
Antipsychotics Dementia residents	79.6 (n = 456)	69.1 (n = 110)	57.9 (n = 19)	53.8 (n = 13)
Antianxiety	79.4 (n = 956)	61.2 (n = 242)	50.0 (n = 62)	51.5 (n = 33)
Antidepressants	85.7 (n = 1618)	76.2 (n = 412)	72.3 (n = 94)	61.5 (n = 52)
Aggressive behaviors	74.1 (n = 1078)	53.4 (n = 341)	42.0 (n = 88)	42.9 (n = 49)
Impaired Cognition	86.4 (n = 3715)	87.8 (n = 812)	88.8 (n = 170)	92.3 (n = 91)
Depressive symptoms	77.7 (n = 1242)	59.1 (n = 447)	57.8 (n = 102)	51.9 (n = 54)
Presence of pain	67.5 (n = 727)	53.0 (n = 251)	32.8 (n = 67)	32.5 (n = 40)
Falls	18.8 (n = 3155)	17.4 (n = 795)	13.9 (n = 173)	13.3 (n = 90)