

Association between dementia and psychiatric disorders in long-term care residents

An observational clinical study

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Abstract

We examine the relationship between dementia and psychiatric disorder diagnoses among long-term care residents in nursing homes across the state of Rhode Island (RI), USA.

Observational clinical study.

Two hundred fifty-five residents with and without the diagnosis of dementia were included in this study.

Prevalence analysis was used to elucidate information on psychiatric disorders in the overall cohort, and among residents with dementia. Questions from the quality of life questionnaire (EQ-5D-3L) that provides information on self-care, anxiety/depression, and resident's view of how healthy they are, were used to evaluate their association with dementia and psychiatric disorders. A logistic regression analysis was conducted to understand the relationship between dementia and mental illness diagnoses in long-term care facilities. Finally, a subgroup logistic regression analysis was performed for residents with Alzheimer disease.

65.1% of all residents suffered from at least 1 psychiatric disorder. Anxiety was the most common diagnosis (36.5%), followed by depression (28.6%), and insomnia (14.9%). There was a positive and statistically significant association between any mental illness diagnosis and dementia (adjusted OR: 3.73; 95% CI: 1.34–10.41). Bipolar disorder and insomnia were negatively and statistically significantly associated with dementia (adjusted OR: 0.17; 95% CI: 0.03–0.89 AND adjusted OR: 0.39; 95% CI: 0.16–0.96 respectively). Age and COPD were also statistically associated with dementia (adjusted OR: 1.07; 95% CI: 1.03–1.11 AND adjusted OR: 0.28, 95% CI: 0.12–0.66). Alzheimer disease was positively and significantly associated with the diagnosis of any mental illness (adjusted OR: 3.77; 95% CI: 1.17–12.20).

We studied the relationship between dementia and diagnoses of psychiatric disorders present in long-term care residents. We found that residents with a diagnosis of dementia were more likely to suffer from at least 1 psychiatric disorder. Further work is needed to establish the neuropathophysiological relationship between psychiatric disorders and dementia.

Abbreviations: CI = confidence interval, LTCF = long-term care facility, NPS = neuropsychiatric symptoms, OR = odds ratio, QoL = quality of life.

Keywords: dementia, long-term care facility, mental illness, psychiatric disorder

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KT designed the study, performed the data collection and analysis, prepared tables and figures, participated in data interpretation, wrote and drafted the initial manuscript, and approved the final manuscript as submitted. Ms KT had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. AN designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. MK designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. FS designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. RvA and AC participated in the designing of the study. EM conceptualized and designed the study, interpreted the data, reviewed and revised the manuscript, and approved the final manuscript as submitted.

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1. Introduction

The Population Reference Bureau estimates that by 2060 approximately 2.3 million individuals over the age of 65 will be residing in nursing facilities.^[1] The Centers for Disease Control and Prevention estimate that in 2016 about 47.8% of nursing home residents suffered from Alzheimer or other dementias.^[2] As a result, many problems experienced by older adults in nursing homes, such as pain and depression, remain understudied.^[3] The ICD-10 defines dementia as “a syndrome due to a disease of the brain, of chronic or progressive nature, and accompanied by impairment of multiple higher cortical functions.”^[4] A mental disorder is defined as “a clinically recognizable set of symptoms or behaviors associated in most cases with distress and with interference with personal functions.”^[5]

Recent studies document a high and growing prevalence of psychiatric disorders in the long-term care setting.^[6,7] Especially, patients diagnosed with a dementia syndrome commonly suffer from secondary psychiatric disorders, which cause suffering to both patients, their families, and their caregivers.^[8] Selbaek et al^[9] studied the incidence of neuropsychiatric conditions among residents in Norwegian nursing homes, and reported that clinically significant neuropsychiatric symptoms (NPS) were present in 84% of residents, with depression reaching 58%. Prado-Jean et al^[10] analyzed psychological and behavioral symptoms of depression in patients with dementia in French nursing homes, and found that NPS were present in 75.9% of residents, with depression being present in 42.9% of residents. Finally, anxiety disorders and symptoms range from 5% to 21% in patients with dementia^[11] and were present in 33.7% of individuals with dementia residing in Norwegian nursing homes.^[12]

In this study, we evaluated the relationship between dementia and psychiatric disorders present among long-term residents in long-term care facilities (LTCFs). We also used dimensions of quality of life (QoL) from the health-related quality of life questionnaire, EQ-5D-3L, to evaluate the association between dementia and psychiatric disorders on resident QoL.

2. Methods

2.1. Data source

An observational clinical study on the impact of vaccine-preventable infections among LTCF individuals was performed in LTCFs across the state of Rhode Island (RI), USA. This study was approved from the Institutional Review Board at the Miriam Hospital in RI, and the demographics and diagnoses of all residents were acquired from the medical records present in LTCFs.

2.2. Study population

The study population consisted of 255 long-term community LTCF residents. Eligible subjects ($n=138$) were individuals who had a diagnosis of dementia (ICD-10-CM codes: F01.x-F03.x, G30.x) in their medical record. The control subjects ($n=117$) were defined as residents without a diagnosis of dementia. Exposure variables were defined as residents with diagnosed psychiatric disorders (ICD-10-CM codes: F06.x, F20.x-F48.x,

F60.x, R44.3, G47.0x, G47.8, G47.9), including depression, anxiety disorders, mood disorder, bipolar disorder, schizophrenia, schizoaffective disorder, insomnia, personality disorders, psychosis, adjustment disorders, delusional disorders, and psychosis with delusions. When ICD-10 codes were not available, the diagnoses for the remaining residents were provided by nursing home personnel.

2.3. Data analysis

Pearson χ^2 tests were used for discrete variables, and Student t test for continuous variables, to compare the differences between the cases and controls. The examined variables included: age, sex, diagnosis of any psychiatric disorder, depression, bipolar, mood disorder, anxiety disorder, schizophrenia, schizoaffective disorder, insomnia, personality disorders, psychosis, psychosis with delusions, delusional disorders, and adjustment disorder. Age was the only continuous variables.

QoL is at the center of healthcare decisions.^[13] As there is no gold standard for health-related quality-of-life measurement,^[14,15] we used a well-established self-reported health-related quality-of-life measure, the EQ-5D-3L.^[16] The EQ-5D-3L has 5 dimensions with 3 categories of severity: mobility, self-care, usual activities, pain or discomfort, and anxiety or depression.^[16,17] In addition to these predefined questions concerning symptoms and functioning, a subjective quality of life was considered global life satisfaction as defined by the respondent. Subjective QoL was measured by asking the respondents to rate their current QoL from 0 to 100, as worst and best possible QoL respectively. For residents with a diagnosis of dementia we used the proxy version of the EQ-5D-3L. This version was filled out by a caregiver at baseline—when a resident was recruited—and by healthcare personnel, that is, nurses, during follow-up visits. We assessed self-care, anxiety or depression, and the subjective QoL score for the entire cohort, residents with dementia, as well as those with a psychiatric disorder diagnoses.

A logistic regression analysis with and without adjusting for covariates was performed to determine the relationship between dementia and the diagnosis of psychiatric disorders. Age, sex, and the nursing homes were included in the logistic regression model to account for confounding factors. A logistic regression analysis with and without confounders was also run for residents diagnosed with dementia of Alzheimer type. Statistical significance was set at the level of $P < .05$. All calculations were performed using STATA 15.1 (StataCorp LLC, TX).

3. Results

3.1. Study population characteristics

A total of 255 LTCF residents were entered in the analyses. One hundred thirty-eight individuals had a diagnosis of dementia, whereas 117 individuals did not. The mean age and corresponding standard deviation (SD) of all residents was 84.1 (11.1) years. More specifically, the mean age and corresponding SD for residents with dementia (cases) and without dementia (controls) were 87.3 (9.2) years and 80.4 (12.0) respectively (Table 2). The majority of the population among both cases and controls were females (83.8% and 64.7% respectively). Previous research has

Table 1**Demographic characteristics, confounding variables, and psychiatric disorders among cases (residents with dementia) and controls (residents without dementia).**

	Overall cohort (n=255)	Cases (n=136)	Controls (n=119)	χ^2	P value
Gender, n (%)					
Female	191 (74.90)	114 (83.82)	77 (64.71)	12.34	.000
Male	64 (25.10)	22 (16.18)	42 (35.29)		
Age, y, mean \pm SD	84.09 \pm 11.08	87.29 \pm 9.15	80.44 \pm 11.97	-5.17*	.000
LTCF					
LTCF#1	35 (13.73)	15 (11.03)	20 (16.81)		
LTCF#2	8 (3.14)	8 (5.88)	0 (0.00)	21.24	.012
LTCF#3	26 (10.20)	11 (8.09)	15 (12.61)		
LTCF#4	13 (5.10)	7 (5.15)	6 (5.04)		
LTCF#5	48 (18.82)	30 (22.06)	18 (15.13)		
LTCF#6	24 (9.41)	15 (11.03)	9 (7.56)		
LTCF#7	17 (6.67)	10 (7.35)	7 (5.88)		
LTCF#8	47 (18.43)	19 (13.97)	28 (23.53)		
LTCF#9	26 (10.20)	18 (13.24)	8 (6.72)		
LTCF#10	11 (4.31)	3 (2.21)	8 (6.72)		
Self-care					
No problems	38 (14.90)	15 (11.03)	23 (19.33)		
Some problems	91 (35.69)	40 (29.41)	51 (42.86)	12.22	.002
Unable to wash/dress self	126 (49.41)	81 (59.56)	45 (37.82)		
Anxiety or depression					
Not anxious/depressed	114 (44.71)	56 (41.18)	58 (48.74)		
Moderately anxious/depressed	129 (50.59)	70 (51.47)	59 (49.58)	5.20	.074
Extremely anxious/depressed	12 (4.71)	10 (7.35)	2 (1.68)		
QoL rating, mean \pm SD	67.71 \pm 19.48	65.76 \pm 20.60	69.94 \pm 17.94	1.72*	.087
Any psychiatric disorder	167 (65.49)	101 (74.26)	66 (55.46)	9.93	.002
Depression	71 (27.84)	42 (30.88)	29 (24.37)	1.34	.247
Bipolar disorder	13 (5.10)	4 (2.94)	9 (7.56)	2.80	.094
Mood disorder	33 (12.94)	20 (14.71)	13 (10.92)	0.81	.369
Anxiety disorder	92 (36.08)	54 (39.71)	38 (31.93)	1.66	.197
Insomnia	39 (15.29)	19 (13.97)	20 (16.81)	0.39	.530
Personality disorder	4 (1.57)	1 (0.74)	3 (2.52)	1.31	.252
Schizophrenia	11 (4.31)	4 (2.94)	7 (5.88)	1.33	.249
Schizoaffective disorder	12 (4.71)	5 (3.68)	7 (5.88)	0.69	.407
Psychosis	7 (2.75)	5 (3.68)	2 (1.68)	0.95	.331
Adjustment disorder	15 (5.91)	6 (4.41)	9 (7.63)	1.18	.278
Psychosis with delusions	12 (4.71)	12 (8.82)	0 (0.00)	11.02	.001
Delusional disorder	6 (2.35)	4 (2.94)	2 (1.68)	0.44	.508

SD = standard deviation, LTCF = long-term care facility, QoL = quality of life.

*Statistical significance was determined by Student *t* test.

indicated that two-thirds of clinically diagnosed cases of dementia and Alzheimer disease are among women,^[18] and a primary reason for this appears to be that women have longer life expectancy.^[19] Table 1 summarizes the demographic characteristics, confounding variables, and prevalence of psychiatric conditions in both cases and controls.

3.2. Prevalence of psychiatric disorders

One hundred thirty-six or 255 residents (53.33%) were diagnosed with at least 1 psychiatric disorder, among which 114 (83.82%) were females and 22 (16.18%) were males. Anxiety was the most common disorder (36.08%), followed by depression (27.84%), and insomnia (15.29%). There was significant variability between nursing homes in proportions of residents with psychiatric diagnoses (Pearson $\chi^2=52.22$, $df=9$, $P<.001$).

More specifically, 74.26% of residents with dementia and 55.46% of residents without dementia suffered from at least 1 psychiatric disorder. Anxiety (39.71% and 31.93% respectively)

was the most common disorder, followed by depression (30.88% and 24.37% respectively), insomnia (13.97% and 16.81%), and mood disorders (14.71% and 10.92%). When comparing residents with and without a diagnosis of dementia, age ($P=0.001$) and gender ($P=0.001$) were statistically significantly different. That is, residents with dementia were older individuals, as well as mostly females. Furthermore, we found a statistically significant difference between the 2 groups in the prevalence of overall psychiatric disorders ($P=0.002$), and psychosis with delusions ($P=0.001$).

3.3. Predictors of psychiatric disorders

Logistic regression analysis showed that residents with a psychiatric diagnosis were more likely to also have had a diagnosis of dementia (OR: 3.67, 95% CI, 1.75–7.67). When gender was considered, male sex was negatively and statistically significantly associated with any psychiatric disorder (OR: 0.43, 95% CI, 0.19–0.99). Furthermore, older adults were less likely to not have a psychiatric diagnosis (OR: 0.94, 95% CI, 0.91–0.98).

Table 2
Predictors of psychiatric disorders in the overall cohort.

	Logistic regression OR (95% CI)
Dementia	3.67 (1.75–7.67)
Self-care	
Some problems	1.44 (0.53–3.96)
Unable to wash/dress self	1.74 (0.62–4.89)
Anxiety or depression	
Moderately anxious/depressed	2.17 (1.04–4.55)
Extremely anxious/depressed	6.58 (0.67–64.59)
QoL rating	0.99 (0.97–1.01)
Age	0.94 (0.91–0.98)
Gender	
Male	0.43 (0.19–0.99)
LTCF#1*	Used as reference
LTCF#2	0.90 (0.15–5.55)
LTCF#3	1.18 (0.35–3.98)
LTCF#4	8.77 (1.91–40.26)
LTCF#5	12.01 (3.72–38.77)
LTCF#6	3.50 (0.99–12.36)
LTCF#7†	None with mental illness
LTCF#8	23.08 (6.55–81.32)
LTCF#9	5.06 (1.45–17.62)
LTCF#10	23.63 (3.41–163.92)

OR = odds ratio, CI = confidence interval, LTCF = long-term care facility.
 $P < .05$ is in boldface.

* LTCF#1 was used as the reference in the logistic regression analysis.

† None of the residents in LTCF#7 were diagnosed with a psychiatric disorder, so logistic regression could not be performed.

All examined predictors of psychiatric disorders are detailed in Table 2.

3.4. EQ-5D-3L data

Self-care, anxiety or depression, and personal QoL rating were independently assessed. In the overall cohort, for the self-care modality, 38 residents reported no issues (14.90%), 91 residents reported some problems (35.69%), and 126 residents reported inability to wash/dress self (49.41%). For the anxiety or depression modality, 114 residents reported no anxiety or depression (44.71%), 129 residents reported moderate anxiety or depression (50.59%), and 12 residents reported extreme anxiety or depression (4.71%).

As shown in Table 3, for individuals with a diagnosis of dementia, the proportion of residents able to practice self-care was statistically different than those who had some problems or

Table 3
Association between quality of life measurements and dementia or psychiatric disorders.

	Dementia	Psychiatric disorder
Self-care (proportion, 95% CI)		
No problems	0.11 (0.07–0.18)	0.14 (0.10–0.21)
Some problems	0.29 (0.22–0.38)	0.36 (0.29–0.44)
Unable to wash/dress self	0.60 (0.51–0.68)	0.50 (0.42–0.57)
Anxiety or depression (proportion, 95% CI)		
Not anxious/depressed	0.41 (0.33–0.50)	0.39 (0.32–0.47)
Moderately anxious/depressed	0.52 (0.43–0.60)	0.55 (0.47–0.62)
Extremely anxious/depressed	0.07 (0.04–0.13)	0.07 (0.04–0.12)

CI = confidence interval.

were unable to practice self-care (proportion 0.11, 95% CI 0.07–0.18 vs 0.29, 95% CI 0.22–0.38 or 0.60, 95% CI 0.51–0.68 respectively). Likewise, the proportion of residents encountering some problems with or being unable to practice self-care (proportion 0.29, 95% CI 0.22–0.38 AND 0.60, 95% CI 0.51–0.68) was statistically different. However, only the proportion of residents who felt or were assessed as extremely anxious/depressed was statistically different than those with moderate or no anxiety/depression among residents of dementia (proportion 0.07, 95% CI 0.04–0.13 vs 0.41, 95% CI 0.33–0.50 or 0.52, 95% CI 0.43–0.60 respectively).

Among individuals with psychiatric disorders, individuals with at least 1 psychiatric disorder experiencing no problems with self-care were statistically different than those who had some problems or were unable to practice self-care (proportion 0.14, 95% CI 0.10–0.21 vs 0.36, 95% CI 0.29–0.44 or 0.50, 95% CI 0.42–0.57 respectively). However, there was no statistical difference between individuals with at least 1 psychiatric disorder experiencing some problems with self-care (proportion 0.36, 95% CI 0.29–0.44) and those who were unable to wash/dress themselves (proportion 0.50, 95% CI 0.42–0.57). Furthermore, individuals with at least 1 psychiatric disorder and extremely anxious/depressed individuals were not statistically different than those with moderate anxiety/depression (proportion 0.39, 95% CI 0.32–0.47 vs proportion 0.55 CI 0.47–0.62). However, moderately anxious/depressed individuals (proportion 0.55 (0.47–0.62) and nonanxious/depressed residents (proportion 0.07 (0.04–0.12)) with at least 1 diagnosis of psychiatric disorder were statistically different.

Among residents with a diagnosis of dementia, 15 (11.03%) reported no problems with self-care (11.03%), 40 reported some problems (29.41%), and 81 residents reported inability to dress/wash themselves (59.56%). For the anxiety/depression modality, 56 residents reported no anxiety or depression (41.18%), 70 residents reported moderate anxiety or depression (51.47%), and 10 reported extreme anxiety or depression (7.35%). Pearson χ^2 test reported a statistically significant difference in assessment of self-care (P value .002) among residents with and without

Table 4
Logistic regression analysis examining the relationship between Alzheimer disease and psychiatric disorders adjusting with potential confounders.

	Adjusted OR (95% CI)
Alzheimer disease	2.48 (1.07–5.78)
Age	0.96 (0.93–0.99)
Sex: male	0.41 (0.19–0.87)
LTCF#1	Used as reference
LTCF#2	2.44 (0.42–14.30)
LTCF#3	1.50 (0.49–4.60)
LTCF#4	6.99 (1.68–29.15)
LTCF#5	8.80 (3.10–24.93)
LTCF#6	4.34 (1.39–13.58)
LTCF#7*	None with psychiatric disorders
LTCF#8	14.02 (4.52–43.44)
LTCF#9	5.08 (1.60–16.13)
LTCF#10	12.30 (2.02–74.87)

OR = odds ratio, CI = confidence ratio, LTCF = long-term care facility.

$P < .05$ is in boldface.

* Logistic regression could not be performed, due to 0 observations in controls.

† No controls existed in LTCF#2.

‡ LTCF#1 was used as the reference in the logistic regression analysis.

dementia, but none for anxiety/depression (P value .074) or QoL rating (P value .087) among residents with and without dementia. As shown in Table 3, for individuals with dementia, there was statistical difference between the three different self-care assessments, and the 3 anxiety or depression assessments.

3.5. Logistic regression analysis for Alzheimer disease

The possible relationship between Alzheimer disease and psychiatric diagnosis was also examined. Results are shown in Table 4. Residents diagnosed with Alzheimer disease had a 2.48-fold higher risk of being diagnosed with any psychiatric disorder (adjusted OR: 2.48, 95% CI: 1.07–5.78) compared with patients with no Alzheimer diagnosis.

4. Discussion

Dementia is a major cause of disability and dependency among older persons.^[20] NPS are of primary concern for dementia care as they are difficult to manage and lead to institutionalization.^[21] We found that the majority (65.49%) of all long-term residents had been diagnosed with at least 1 psychiatric disorder diagnosis and anxiety, depression, and insomnia were the most common diagnoses. Our analyses showed that there is a positive and statistically significant association between a diagnosis of psychiatric disorder and dementia. Furthermore, residents with at least 1 psychiatric disorder were more likely to report experiencing moderate anxiety/depression on the EQ-5D-3L. Finally, in a separate analysis, Alzheimer disease was also positively and statistically significantly associated with the diagnosis of psychiatric disorder.

To date, various studies have looked at the prevalence of psychiatric disorders in individuals diagnosed with dementia, and who reside in nursing facilities.^[9,10,12] Brodaty et al^[22] found the prevalence of psychosis and depression to be 56% and 44.1% respectively in Australian LTCF residents suffering from dementia, whereas we reported 3.6% and 33.3% respectively. Similar to Brodaty et al we found that younger age was associated with overall psychiatric diagnoses prevalence.^[22] Notably, although psychosis symptoms are known to frequently accompany dementia,^[23] in our sample the percentage of these cases was small. A possible explanation is that psychosis is more common in the late stages of dementia,^[23] while the majority of cases in our sample were mildly cognitively impaired.

Understanding the relationship between mental illness and dementia is critical, to maximize residents' quality of life. The probability of exhibiting behavioral and psychological symptoms in dementia reaches a peak in people with moderate to severe cognitive impairment and decreases with further cognitive decline.^[24] Therefore, paying close attention to the symptoms and behavioral changes of these individuals is imperative to maximize quality of care in institutions such as LTCFs. Furthermore, residents with psychiatric disorders, and especially those suffering from dementia, are less likely than residents without psychiatric disorders to be rated as having pain.^[25] Nursing home staff are still experiencing problems identifying signs of psychiatric disorder.^[26] Previous research among Spanish elderly institutionalized in residential care facilities has shown that over a period of 20 months, there was a significant decrease in resident QoL.^[27] Dependency on others to perform activities of daily living has been reported as the major contributor to health-related QoL.^[28]

Despite we did not study the temporal relationship between psychiatric disorder and dementia, several studies have. Wu et al^[29] found that bipolar disorder was significantly associated with an increased risk of subsequent dementia, but not in the long-term care setting. However, Carnahan and Letuchy^[30] conclude that bipolar disorder in nursing home residents was diagnosed after dementia. Schizophrenia was also significantly associated with the risk of all-cause dementia in a population-based cohort study in Taiwan, but not in the long-term care setting.^[31] Dotson et al^[32] show that recurrent major depression in earlier adulthood increases the risk of dementia in later life. Finally, late-life anxiety is associated with cognitive impairment and decline.^[33] In our study, although we are not able to deduce a temporal link between dementia and bipolar disorder, the prevalence of bipolar disorder was less than 3% among residents with dementia.

Being able to study elderly populations residing in LTCFs is limited due to the changes in their cognitive status. Significantly, changes in cognitive status have implications on informed consent and therefore lead to limited ability of assessing the way they feel as well as their ability to participate in activities of daily living. When we assessed resident ability to practice self-care, as well as their ability to assess their level of anxiety/depression, the proxy version of the EQ-5D-3L was used. The underlying assumption is that the proxy can report accurately on the status of the subject.^[34] Despite that proxy information on past and present health conditions has been shown to be in agreement with self-report,^[35] proxy ratings of health-related QoL do not always seem to be in accordance with patients' own answers.^[36] Furthermore, health caregivers may be better raters of patients' functional status and physical symptoms, and significant others may be more accurate in assessing patients' psychological and social health.^[37] In this study, caregivers were used as the proxy at baseline (when recruiting the resident), and healthcare personnel at the nursing homes were used for measurements of QoL during follow-up visits. Resident and proxy answers to EQ-5D-3L modalities were statistically significantly different only for the self-care modality, but not for the anxiety or depression, or the personal QoL rating.

In this paper, we show an association between dementia and psychiatric disorders, among individuals who had already been diagnosed with either conditions. Therefore, there is a compelling argument to be made for the need of psychiatric consultations for all nursing home residents, and especially those with an already existing diagnosis of dementia. Furthermore, research shows that majority of nursing home residents have psychiatric disorders on admission,^[38] thus there is a need for a psychiatric consultation upon admission.

Effective interventions for the prompt and accurate diagnosis of psychiatric disorders among nursing home residents include in-service teaching of psychiatric disorders, and increased staff-to-patient ratio.^[8] Furthermore, social workers should be utilized to help alleviate distress as well as provide information for whatever the families of persons placed in LTCFs might need.^[8] Most importantly, this will enhance the ability of family members to participate in the day-to-day care of their loved one, and thus at the same time alleviate the burden on nursing staff. Finally, activity therapy enhances the mood, as well as improves socialization among LTCF residents, is recommended.^[8]

Although our findings are compelling, several potential limitations should be mentioned. First, our study was limited to only 10 facilities in the state of RI. Thus, the sample might not

be representative of different populations across the state or nation. This becomes intensified when looking at residents diagnosed with Alzheimer disease. Second, literature suggests that about 60% of all dementia cases are attributed to Alzheimer disease.^[39] However, in our analyses Alzheimer disease was only present in 35.1% of residents with a diagnosis of dementia, indicating that the applicability of the results could be limited.

Third, the data presented did not differentiate between different severity levels of dementia, thus the results might not apply to the same extent to residents with less severe cognitive impairment than to residents with more moderate cognitive impairment. At the same time, no temporal relationship can be established. Fourthly, for residents with dementia the proxy version of the EQ-5D-3L was used. The underlying assumption made is that the proxy can report accurately on the status of the subject.^[34] However, despite proxy information on past and present health conditions has been shown to be in agreement with self-report,^[35] proxy ratings of health-related QoL do not always seem to be in accordance with patients' own answers.^[36] Finally, in this study, we only accounted for 2 modalities (self-care and anxiety/depression), and we do not provide QoL score for the residents. However, previous research among Spanish elderly institutionalized in residential care facilities has shown that over a period of 20 months, there was a significant decrease in resident QoL.^[27]

5. Conclusions and implications

The findings from the present study document a strong relationship between dementia and psychiatric disorders. However, nursing home staff are still experiencing problems identifying signs of psychiatric disorders.^[26] Therefore, additional studies need to make sure that neuropsychiatric symptoms are diagnosed correctly as neuropsychiatric symptoms, and are not new psychiatric disorders. It is therefore critical to understand the relationship between psychiatric disorders and dementia, to maximize resident quality of life.

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Author contributions

Guarantors of the article: Katerina Tori, Sc.B., and Eleftherios Mylonakis, MD, PhD.

Specific Author Contributions: KT designed the study, performed the data collection and analysis, prepared tables and figures, participated in data interpretation, wrote and drafted the initial manuscript, and approved the final manuscript as submitted. Ms. Tori had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. AN designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. MK designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. FS designed the study, participated in data collection, extraction and interpretation, revised the manuscript, and approved the final manuscript as submitted. RvA and AC participated in the

designing of the study. EM conceptualized and designed the study, interpreted the data, reviewed and revised the manuscript, and approved the final manuscript as submitted.

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