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ORIGINAL ARTICLE

Long-term care utilization and all-cause mortality among older adults with major psychiatric disorders: a 5-year prospective multicenter study

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Objective: As the population ages, the number of older adults with psychiatric disorders in long-term care facilities is expected to significantly increase. To our knowledge, no study has examined the association between long-term care utilization and all-cause mortality among older adults with psychiatric disorders.
Methods: In this report, we used data from the Cohort of Individuals with Schizophrenia, Bipolar and Major Depressive Disorder Aged 55 Years or More, a 5-year prospective multicenter study, to examine this association. All analyses were adjusted for a wide range of potential confounders, including sociodemographic and clinical characteristics and psychotropic medication use.
Results: The prevalence of long-term care utilization was 23.6% (n=132) among 559 older adults with major psychiatric disorders. Living in a long-term care facility was significantly and independently associated with increased all-cause mortality in both the crude (OR = 2.54; 95%CI 1.67-3.87; $p < 0.001$) and fully-adjusted multivariable logistic regression models (AOR = 1.86; 95%CI 1.10-3.16; $p = 0.021$). This association did not vary significantly across most subgroups defined by sociodemographic and clinical characteristics.
Conclusion: In this multicenter prospective observational study of older adults with major psychiatric disorders, long-term care utilization was significantly associated with increased all-cause mortality. Physicians and policy makers should take this association under careful consideration.

Keywords: Institutionalization; long-term care utilization; older; schizophrenia; bipolar disorder; major depressive disorder; mortality

Introduction

As the population ages, the number of older patients with psychiatric disorders who need to live in long-term care facilities, defined as assisted-living settings that include formal supervision, such as nursing homes, retirement houses, psychiatric wards that allow stays over 3 months, and chronic care beds, is expected to increase

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significantly.[1-7] For example, a U.S. study found that about 15% of older adults with schizophrenia are living in long-term hospitals or nursing homes.[8]

While a prior study suggested an association between long-term care utilization and all-cause mortality among older adults,[9] to our knowledge, no study has specifically examined this issue among older adults with psychiatric disorders or the potential role of clinical factors in this putative association. This knowledge could have important implications since, among older adults with psychiatric disorders who live in long-term care facilities, it may help clinicians identify those at greater risk of death. Furthermore, it may help policy makers develop targeted interventions and strategies aimed at reducing this risk and improving the overall health of this growing vulnerable population.[10]

In this report, we used data from the Cohort of individuals with Schizophrenia, Bipolar and Major Depressive Disorder Aged 55 Years or More, a 5-year prospective multicenter study of older adults with major psychiatric disorders, to examine the association between long-term care utilization and all-cause mortality. All analyses were adjusted for a wide range of potential confounders, including sociodemographic and clinical characteristics and psychotropic medication use. We hypothesized that long-term care utilization would be independently associated with increased all-cause mortality in this population, globally and across subgroups defined by sociodemographic and clinical characteristics.

Methods

Sample

Longitudinal data were drawn from the Cohort of individuals with Schizophrenia, Bipolar and Major Depressive Disorder Aged 55 Years or More, which included 634 older adults with an ICD-10 diagnosis of schizophrenia (n=353), bipolar disorder (n=139) or major depressive disorder (n=142). A more detailed description of the study methodology can be found elsewhere.[3,11-18] Participants were recruited between February 2010 and June 2013 from French state hospital psychiatric departments that covered 63 mutually independent catchment areas. Exclusion criteria included limited French proficiency, not being affiliated to the social security system, meeting ICD-10 criteria for any pervasive developmental disorder or major neurocognitive disorder, having any neurological disorder that affects the central nervous system, or having any life-threatening medical or surgical condition requiring immediate treatment. All participants were interviewed face-to-face by their treating psychiatrist, who collected all clinical data.

Assessment of long-term care utilization

Long-term care utilization was defined as living, at the time of the baseline interview, in a dwelling that offered some form of formal supervision, including nursing homes, retirement houses, long term stay wards (over 3 months), or chronic care beds, and excluded temporary admission for convalescence or rehabilitation.[19,20]

Sociodemographic and clinical characteristics

Sociodemographic characteristics

Sociodemographic characteristics included sex, age (categorized by the median in the full sample [i.e., 66 years]), education (i.e., $<$ high school, high school, or $\geqslant$ university), marital status (married or as if married vs. not married), urbanicity (defined as living in an area with $>$ 1,000 inhabitants per km^2), parenthood, and inpatient status (i.e., whether the patient was hospitalized or not at baseline).

Clinical characteristics

Diagnoses of schizophrenia, bipolar disorder, and major depressive disorder were established face-to-face by the treating psychiatrist according to ICD-10 criteria. Data on general medical conditions were also recorded by the treating psychiatrist, including: the number of non-psychiatric medical comorbidities (mean [SD] = 2.4 [1.64]; median = 2; interquartile range = 1-3); malnutrition (defined as a body mass index $<$ 23 kg/m^2)[21]; obesity (defined as a body mass index $>$ 30 kg/m^2)[22,23]; at-risk alcohol consumption based on the vs. Cut, Annoyed, Guilt, and Eye questionnaire[22]; current smoking status (smoking vs. not smoking)[23]; and consultation with a general practitioner in the past year.

Disorder severity

The severity of schizophrenia, bipolar disorder and major depressive disorder was determined using the Brief Psychiatric Rating Scale (BPRS),[24] the Mini-Mental State Examination (MMSE),[25] and the Global Assessment of Functioning (GAF) scale,[26] categorized by their respective medians (BPRS, $>$ 36 vs. $\leqslant$ 36; MMSE, $>$ 26 vs. $\leqslant$ 26; and GAF, $>$ 50 vs. $\leqslant$ 50). The BPRS, a well-validated 18-item scale,[24] was used to measure general psychiatric symptoms, including affective, positive, and negative symptoms. Each symptom is rated from 1 (absent) to 7 (severe). The MMSE was used to evaluate cognitive functioning.[25] The GAF scale was used to evaluate the participants' overall psychological, social, and occupational functioning.[26]

Psychotropic medications

For all participants, any psychotropic medications prescribed at the time of the baseline interview were recorded, specifically antipsychotics, antidepressants, benzodiazepines, and mood stabilizers.

Causes of death

Deaths were confirmed by a mortality review committee (comprising NH and FL) based on information from treating psychiatrists, hospital records, death certificates, autopsy reports, obituaries, and interviews with physicians or next of kin. Cause of death was adjudicated as disease-related mortality, including cardiovascular disease mortality (due to coronary heart disease, cerebrovascular disease, heart failure, or peripheral vascular

disease) or mortality due to a non-cardiovascular disease (i.e., infection), and suicide or non-suicidal injury.

Statistical analyses

We calculated the frequencies and means (SD) of all baseline characteristics described above in the full sample, comparing them using standardized mean differences.[27]

To examine the association between long-term care utilization and 5-year all-cause mortality among older patients with major psychiatric disorders, we performed, successively, one crude and two multivariable logistic regression models to reduce the effects of confounding. The first multivariable model (Model 1) was adjusted for sex, age, education, marital status, urbanicity, parenthood, inpatient status, psychiatric disorder, number of medical conditions, malnutrition, obesity, at-risk drinking, smoking status, consultation with a general practitioner in the past year, and BPRS, MMSE, and GAF scores (degrees of freedom = 20). The second multivariable model (Model 2) was further adjusted for psychotropic medications, including antipsychotics, antidepressants, benzodiazepines, and mood stabilizers (degrees of freedom = 24).

If the primary analysis yielded a significant association between long-term care utilization and all-cause mortality, we intended to perform two additional analyses. First, we would examine the potential association between long-term care utilization and each cause of death (i.e., due to any disease, cardiovascular disease, non-cardiovascular disease, non-suicidal injury, or suicide) using the same regression models and adjustments as performed in the main analysis. Second, we planned to explore potential moderators of the main association by testing whether certain sociodemographic or clinical characteristics significantly modified the magnitude of the association between long-term care utilization and all-cause mortality. For each characteristic, we added an interaction term characteristic*long-term care utilization to the multivariable logistic regression models. This additional analysis could help determine whether the main association applied to all participants or only specific subgroups.

For all analyses, statistical significance was determined using a two-sided alpha set *a priori* at 0.05. We performed residual analyses for all associations to determine data fit and to check the assumptions. All analyses were conducted in R 4.4.2 (R Project for Statistical Computing).

Ethics statement

The research protocol, including informed consent procedures, was conducted in accordance with Declaration of Helsinki ethical guidelines and received full ethical review and approval from the local research ethics committee, the Advisory Committee on Information Processing in Health-related Material Research, and the National Board on Computerized Information and Freedoms.[28-30]

Results

Sample characteristics

Of 634 older adults with an ICD-10 diagnosis of schizophrenia, bipolar disorder or major depressive disorder, 76 (12%) were excluded from the analysis due to missing data. Of the remaining 559 patients, 132 (23.6%) were institutionalized and 427 (76.4%) were not (Supplementary Figure S1).

In the full sample, sex, age, education level, parenthood, inpatient status, number of medical conditions, and antipsychotic use were significantly and independently associated with 5-year all-cause mortality (Supplementary Table S1). The distribution of baseline characteristics according to long-term care utilization is shown in Table 1.

Causes of death

The prevalence of 5-year all-cause mortality was 39.4% (n=52) and 20.4% (n=87) among institutionalized and non-institutionalized older adults, respectively. Long-term care utilization was significantly associated with all-cause mortality in the crude regression model (odds ratio [OR] = 2.54; 95%CI 1.67-3.87; $p < 0.001$) and both adjusted regression models (model 1: adjusted OR [AOR] = 1.72; 95%CI 1.03-2.88; p = 0.039; and model 2: AOR = 1.89; 95%CI 1.11-3.19; p = 0.018) (Table 2). This association remained significant for disease-related mortality (model 1: AOR = 2.13; 95%CI 1.20-3.76; p = 0.009; and model 2: AOR = 2.35; 95%CI 1.31-4.20; p = 0.004) and cardiovascular-related mortality (model 1: AOR = 2.65; 95%CI 1.31-5.36; p = 0.007; and model 2: AOR = 2.89; 95%CI 1.41-5.94; p = 0.004). Long-term care utilization was not significantly associated with the other causes of death (Figure 1 and Table 2).

Finally, the only significant moderating effects for the main association among the sociodemographic and clinical characteristics were BPRS score and benzodiazepine use (interaction OR = 0.35; 95%CI 0.13-0.98; p = 0.046; and interaction OR = 0.34; 95%CI 0.12-0.91; p = 0.032, respectively) (Table 3; Supplementary Figure S2), suggesting that the association between long-term care utilization and mortality was significantly stronger in participants with lower BPRS scores and in those who did not use benzodiazepines than in their counterparts.

Discussion

In this longitudinal observational study of 559 older adults with major psychiatric disorders, we found that long-term care utilization was significantly associated with higher all-cause mortality, independently of sociodemographic and clinical characteristics or psychotropic medication use. This finding aligns with prior research suggesting an increased risk of death associated with long-term care utilization among older adults.[9] This association appeared to be specific to disease-related mortality, particularly cardiovascular-related mortality. While this suggests specific vulnerabilities rather than general vulnerability to all-cause mortality, we cannot rule out that other

Table 1 Distribution of baseline characteristics across long-term care groups among older adults with an ICD-10 diagnosis of schizophrenia, bipolar disorder, or major depressive disorder (n=559)

	Institutionalized (n =132)	Non-institutionalized (n=427)	Comparison between groups (SMD)
Sociodemographic characteristics			
Sex: male (vs. female)	64 (48.5)	175 (41.0)	**0.151**
Age : ⩾ 66 years (vs. < 66 years)	73 (55.3)	192 (45.0)	**0.208**
Education			**0.168**
< High school	90 (68.2)	263 (61.6)	
High school	20 (15.2)	65 (15.2)	
⩾ University	22 (16.7)	99 (23.2)	
Marital status: married or as if married (vs. not married)	4 (3.03)	149 (34.9)	**0.890**
Urbanicity	19 (14.4)	87 (20.4)	**0.158**
Parenthood	53 (40.2)	272 (63.7)	**0.485**
Inpatient status	30 (22.7)	109 (25.5)	0.0065
Clinical characteristics			
Type of psychiatric disorder			**0.816**
Schizophrenia disorder	109 (82.6)	202 (47.3)	
Bipolar disorder	15 (11.4)	107 (25.1)	
Major depressive disorder	8 (6.06)	118 (27.6)	
Number of medical conditions	2.39 (1.61)	2.36 (1.65)	0.016
BMI (kg/m^2)			**0.189**
< 23	40 (30.3)	120 (28.1)	
23-30	53 (40.2)	209 (48.9)	
> 30	39 (29.5)	98 (23.0)	
At-risk drinking	6 (4.55)	54 (12.6)	**0.292**
Current smoking	33 (25.0)	109 (25.5)	0.012
Consultation with a general practitioner in the past year	98 (74.2)	381 (89.2)	**0.395**
Disorder severity			
BPRS: > 36 (vs. ⩽ 36)	91 (68.9)	182 (42.6)	**0.550**
MMSE: > 26 (vs. ⩽ 26)	35 (26.5)	195 (45.7)	**0.407**
GAF: > 50 (vs. ⩽ 50)	34 (25.8)	244 (57.1)	**0.672**
Psychotropic medication			
Antipsychotics	108 (81.8)	279 (65.3)	**0.380**
Antidepressants	32 (24.2)	185 (43.3)	**0.412**
Benzodiazepines	57 (43.2)	156 (36.5)	**0.136**
Mood stabilizers	40 (30.3)	126 (29.5)	0.017

Data presented as n (%), unless otherwise specified.
SMDs > 0.10 in bold are considered as substantial differences.
BMI = body mass index; BPRS = Brief Psychiatric Rating Scale; GAF = Global Assessment of Functioning; MMSE = Mini Mental State Examination; SMD = standardized mean differences.

associations may have been undetected due to insufficient statistical power in our sample.

Several factors could explain the association between long-term care and all-cause mortality. First, previous studies have found that the prevalence of nutritional issues varies between 15 and 65% among older adults who live in long-term care facilities.[31,32] These nutritional issues can exacerbate health conditions, such as cardiovascular disease and infections, leading to higher mortality in these patients.[31,33] Second, older age and higher rates of comorbidities,[34] greater functional limitations,[35] higher vulnerability to infection,[36] and polypharmacy,[37] which are associated with long-term care utilization, could also partially explain this finding. Finally, social isolation[38] and end-of-life issues,[39] with a focus on comfort care in end-of-life scenarios, which are more often observed among institutionalized older adults than in those living at home, as well as variable care quality,[40] could also have contributed to this association.

The association between long-term care utilization and mortality did not significantly vary across most subgroups defined by sociodemographic and clinical characteristics. The two exceptions were lower BPRS scores (reflecting less severe global psychopathology) and non-use of benzodiazepines, for which the association between long-term care utilization and mortality was significantly stronger. This might be explained by the fact that those with lower BPRS scores had a lower absolute risk of death than those with more severe psychiatric symptoms and those taking benzodiazepines, and thus long-term care utilization may have had a greater effect on mortality in these subgroups of patients. In other words, this finding suggests a potential ceiling effect: among patients who already have a very high mortality risk due to their clinical severity[17] or benzodiazepine use,[41] the additional effect of institutionalization could be reduced. However, we cannot rule out that this might also be explained by type 1 error inflation due to multiple testing.

Table 2 Association of long-term care utilization with causes of death in the full sample

	Mortality events/n (%)	Crude logistic regression OR (95%CI; p-value)	Model 1† AOR (95%CI; p-value)	Model 2‡ AOR (95%CI; p-value)
All-cause mortality (n=559)				
Institutionalized	52/132 (39.4)	**2.54 (1.67-3.87; < 0.001)***	**1.72 (1.03-2.88; 0.039)***	**1.89 (1.11-3.19; 0.018)***
Non-institutionalized	87/427 (20.4)	Ref.	Ref.	Ref.
Disease-related mortality (n=530)				
Institutionalized	43/123 (35.0)	**2.73 (1.73-4.29; < 0.001)***	**2.13 (1.20-3.76; 0.009)***	**2.35 (1.31-4.20; 0.004)***
Non-institutionalized	67/407 (16.5)	Ref.	Ref.	Ref.
Cardiovascular-related mortality (n=481)				
Institutionalized	26/106 (24.5)	**3.16 (1.80-5.54; < 0.001)***	**2.65 (1.31-5.36; 0.007)**	**2.89 (1.41-5.94; 0.004)**
Non-institutionalized	35/375 (9.3)	Ref.	Ref.	Ref.
Disease-related non-cardiovascular mortality (n=469)				
Institutionalized	17/97 (17.5)	**2.26 (1.19-4.27; 0.012)***	1.56 (0.68-3.62; 0.296)	2.00 (0.83-4.81; 0.123)
Non-institutionalized	32/372 (8.6)	Ref.	Ref.	Ref.
Non-suicidal injury (n=431)				
Institutionalized	3/83 (3.6)	1.59 (0.41-6.14; 0.498)	N/A	N/A
Non-institutionalized	8/348 (2.3)	Ref.	Ref.	Ref.
Death by suicide (n=436)				
Institutionalized	5/85 (5.9)	1.93 (0.65-5.72; 0.234)	1.10 (0.28-4.24; 0.891)	1.36 (0.33-5.66; 0.675)
Non-institutionalized	11/351 (3.1)	Ref.	Ref.	Ref.

Sample sizes can fluctuate due to the exclusion of participants who died from another cause.
Bold type denotes statistical significance ($p < 0.05$).
AOR = adjusted odds ratio; N/A = not available; OR = odds ratio.
† Multivariable logistic regression, Model 1: adjusted for sex, age, education, marital status, urbanicity, parenthood, inpatient status, types of psychiatric disorders, number of medical conditions, body mass index (BMI), at-risk drinker, current smoker, consultation with a general practitioner in the past-year, Brief Psychiatric Rating Scale (BPRS), Mini Mental State Examination (MMSE), Global Assessment of Functioning (GAF) (degrees of freedom = 20; all generalized variance inflation factor [GVIF] < 2.50).
‡ Multivariable logistic regression, Model 2: adjusted for sex, age, education, marital status, urbanicity, parenthood, inpatient status, types of psychiatric disorders, number of medical conditions, BMI, at-risk drinking, current smoking, consultation with a general practitioner in the past year, BPRS, MMSE, GAF, antipsychotics, antidepressants, benzodiazepines, and mood stabilizers (degrees of freedom = 23; all GVIF < 2.50).
* Two-sided p-value is significant ($p < 0.05$).

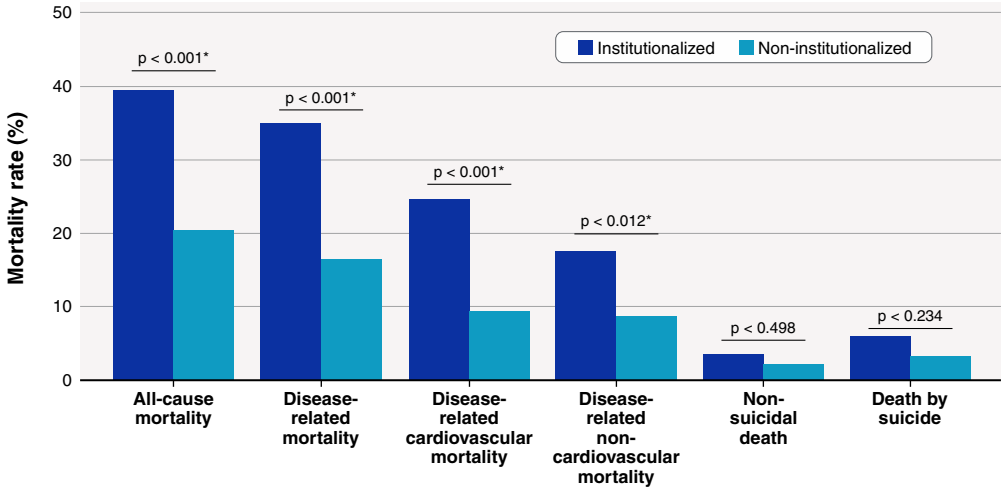


Figure 1 Mortality rates according to long-term care utilization. * Two-sided p-value is significant ($p < 0.05$).

Table 3 Examining the interaction terms between long-term care utilization and all-cause mortality according to sociodemographic and clinical characteristics

	Covariable* long-term care utilization (Model 1)[†]	Covariable* long-term care utilization (Model 2)[‡]
	IOR (95%CI; p-value)	IOR (95%CI; p-value)
Sociodemographic characteristics		
Sex: male (vs. female)	0.97 (0.39-2.42; 0.941)	1.15 (0.45-2.94; 0.775)
Age: ⩾ 66 years (vs. < 66 years)	0.74 (0.29-1.86; 0.517)	0.76 (0.3-1.93; 0.562)
Education		
< High school	Ref.	Ref.
High school	1.54 (0.42-5.62; 0.511)	1.48 (0.4-5.53; 0.561)
⩾ University	3.16 (0.87-11.50; 0.081)	3.57 (0.94-13.58; 0.062)
Marital status: married or as if married (vs. not married)	0.55 (0.05-6.72; 0.643)	0.84 (0.07-10.10; 0.888)
Urbanicity	0.49 (0.14-1.72; 0.267)	0.50 (0.14-1.77; 0.285)
Parenthood	1.76 (0.68-4.58; 0.243)	1.88 (0.71-4.98; 0.204)
Inpatient status	1.83 (0.65-5.17; 0.256)	1.61 (0.56-4.65; 0.380)
Clinical characteristics		
Types of psychiatric disorder		
Schizophrenia disorder	Ref.	Ref
Bipolar disorder	1.25 (0.31-5.04; 0.756)	1.43 (0.34-6.06; 0.630)
Major depressive disorder	1.61 (0.30-8.61; 0.575)	1.44 (0.26-7.88; 0.672)
Number of medical conditions	1.24 (0.78-1.97; 0.365)	1.19 (0.74-1.91; 0.480)
BMI (kg/m^2)		
< 23	1.26 (0.42-3.72; 0.680)	1.33 (0.44-4.00; 0.617)
23-30	Ref.	Ref.
> 30	0.64 (0.18-2.33; 0.498)	0.65 (0.17-2.44; 0.523)
At-risk drinking	1.60 (0.22-11.90; 0.644)	1.94 (0.27-14.20; 0.515)
Current smoking	2.11 (0.73-6.07; 0.167)	2.29 (0.78-6.73; 0.130)
Consultation with a general practitioner in the past year	0.84 (0.26-2.76; 0.776)	0.94 (0.28-3.11; 0.918)
Disorder severity		
BPRS: > 36 (vs. ⩽ 36)	**0.35 (0.13-0.95; 0.039)***	**0.35 (0.13-0.98; 0.046)***
MMSE: > 26 (vs. ⩽ 26)	1.77 (0.64-4.94; 0.272)	1.68 (0.58-4.86; 0.335)
GAF: > 50 (vs. ⩽ 50)	1.78 (0.64-4.92; 0.266)	1.68 (0.59-4.76; 0.328)
Psychotropic medication		
Antipsychotics	-	1.79 (0.49-6.52; 0.380)
Antidepressants	-	2.30 (0.79-6.70; 0.127)
Benzodiazepines	-	**0.34 (0.12-0.91; 0.032)***
Mood stabilizers	-	1.56 (0.52-4.64; 0.427)

Bold type denotes statistical significance ($p < 0.05$).
IOR = interaction odds ratio.
[†] Multivariable logistic regression, Model 1: adjusted for sex, age, education, marital status, urbanicity, parenthood, inpatient status, types of psychiatric disorders, number of medical conditions, body mass index (BMI), at-risk drinking, current smoking, consultation with a general practitioner in the past year, Brief Psychiatric Rating Scale (BPRS), Mini Mental State Examination (MMSE), Global Assessment of Functioning (GAF).
[‡] Multivariable logistic regression, Model 2: adjusted for, sex, age, education, marital status, urbanicity, parenthood, inpatient status, types of psychiatric disorders, number of medical conditions, BMI, at-risk drinking, current smoking status, consultation with a general practitioner in the past year, BPRS, MMSE, GAF, antipsychotics, antidepressants, benzodiazepines, and mood stabilizers.
* Two-sided p-value is significant ($p < 0.05$).

Our findings highlight several important implications for the clinical care of older adults with major psychiatric disorders. First, our results highlight the importance of designing appropriate health management strategies, particularly for cardiovascular diseases, which represents an important cause of death in this population.[42] This is especially important as cardiovascular mortality in institutionalized older patients with major psychiatric disorders is often linked to factors that can be addressed by the healthcare system, including lifestyle habits, nutrition and metabolic issues, and side effects of psychotropic medications.[43] Second, health programs should include collaborative strategies aimed at improving communication between mental health and long-term care practitioners to facilitate prevention, early detection, and management of physical issues. Finally, encouraging older patients to engage in adequate physical activity and healthy lifestyle habits through health psychoeducation and regular health screening procedures could be effective for reducing mortality and improving the overall health of this population.[44-48]

This study has several limitations. First, given the observational design, associations should not be interpreted as causal effects.[49] Second, there are two possible major inherent biases in observational studies: unmeasured confounding and confounding by indication. Some amount of unmeasured confounding may remain. However, in order to minimize those risks, all analyses were

adjusted for several potential confounders, including sociodemographic characteristics, clinical severity assessments (BPRS, MMSE, and GAF), medical comorbidities, and psychotropic medications. Finally, some potentially important information was not available in this study, including the type of facility where the patients were institutionalized, the length of stay, and the type of care received,[3] which could have different effects on mortality.[50] Future studies examining these issues would be important.

In this multicenter prospective observational study of 559 older adults with major psychiatric disorders, we found that long-term care utilization was significantly associated with increased all-cause mortality. Physicians and policy makers should take this association under careful consideration.

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Disclosure

The authors report no conflicts of interest.

Data Availability Statement

The data that support this study are available from the authors upon request.

Author Contributions

KR: Formal analysis, Investigation, Writing – original draft.
MSR: Data curation, Formal analysis, Visualization, Writing – review & editing.
PL: Writing – review & editing.
CH: Writing – review & editing.
EL: Writing – review & editing.
FL: Supervision, Writing – review & editing.
NH: Conceptualization, Methodology, Project Administration, Writing – original draft.

All authors have read and approved of the final version to be published.

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