Loneliness and Symptom Burden in Oncology Patients During the COVID-19 Pandemic

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Abstract

BACKGROUND: Loneliness and social isolation are significant public health problems that are being exacerbated during the coronavirus disease 2019 pandemic. Little is known about the associations between loneliness and symptom burden in oncology patients before and during the pandemic. Study purposes include determining the prevalence of loneliness in a sample of oncology patients; evaluating for differences in demographic, clinical, and symptom characteristics between lonely and nonlonely patients; and determining which demographic, clinical, and symptom characteristics were associated with membership in the lonely group.

METHODS: A convenience sample (n = 606) completed online surveys that evaluated the severity of loneliness, social isolation, and common symptoms (ie, anxiety, depression, fatigue, sleep disturbance, cognitive dysfunction, and pain) in oncology patients. Parametric and nonparametric tests were used to evaluate for differences in scores between the lonely and nonlonely groups. Logistic regression analysis was used to determine risk factors for membership in the loneliness group.

RESULTS: Of the 606 patients, 53.0% were categorized in the lonely group. The lonely group reported higher levels of social isolation, as well as higher symptom severity scores for all of the symptoms evaluated. In the multivariate model, being unmarried, having higher levels of social isolation, as well as higher levels of anxiety and depressive symptoms were associated with membership in the lonely group.

CONCLUSIONS: Study findings suggest that a significant number of oncology patients are experiencing loneliness, most likely as a result of mandate social distancing and isolation procedures. The symptom burden of these patients is extremely high and warrants clinical evaluation and interventions.

INTRODUCTION

Before the coronavirus disease 2019 (COVID-19) pandemic, loneliness and social isolation were gaining recognition as major public health problems because of their independent associations with increased morbidity and mortality.[1–3] Although loneliness (ie, subjective feeling of the absence of a social network or a companion) and social isolation (ie, objective lack of interactions with others or the wider community)[4] are consider to be distinct concepts, they are known to be interrelated with social isolation being a risk factor for loneliness.[5]

The COVID-19 pandemic has brought to the forefront the problem of loneliness and its association with negative health outcomes. Stay-at-home orders and other mitigation procedures have led to reports of significant levels of loneliness in the general population.[6–9] For example, in a study of adults in the United Kingdom, the prevalence of loneliness was 27%. Across 2 longitudinal studies in the United States, findings regarding changes in loneliness over time are inconsistent. In one study of 1545 adults,[7] the severity of loneliness did not change over 3 months. In contrast, in a study of ~1000 adults, the prevalence of loneliness and severity of loneliness increased over 5 months. A total of 64% of the participants who reported being under stay-at-home/shelter-in-place/lockdown orders were categorized as lonely. In addition, loneliness was associated with higher levels of depressive symptoms, as well as suicidal ideation. Reasons for these inconsistent findings are not readily apparent.

Although the impact of loneliness on morbidity and mortality is not well studied in oncology patients,[4] in a meta-analysis of risk factors for loneliness in oncology patients,[10] occurrence rates for a moderate degree of loneliness ranged from 32% to 47%.[11–13] In the studies that used University of California Los Angeles (UCLA) Loneliness Scale,[14] the weighted mean loneliness score was 38.3, which is above the normative score of ~36.[4] The risk factors for higher loneliness scores included longer time since cancer diagnosis, being unmarried, and lack of psychological or social support.

As noted in 2 recent qualitative reports of psychological issues during COVID-19,[15,16] oncology patients are experiencing loneliness. In one study,[16] 36.3% of the patients reported being lonely and feeling isolated. In the other study,[15] patients described a "deep sense of loneliness" as a result of social distancing procedures. However, no studies have evaluated for the occurrence of and risk factors for loneliness in oncology patients during COVID-19 using quantitative measures. Therefore, our study purposes were to determine the prevalence of loneliness in a convenience sample of oncology patients (n = 606); evaluate for differences in demographic, clinical, and symptom characteristics between lonely and nonlonely patients; and determine which demographic, clinical, and symptom characteristics were associated with membership in the lonely group.

MATERIALS AND METHODS

Sample and Settings

Patients were recruited from a registry of individuals who participated in our previous National Cancer Institute-funded studies (CA187160, CA212064, and CA151692) and from Dr. Susan Love Foundation for Breast Cancer Research. Potential participants received an email with a brief explanation of the study and a link that directed them to the study's enrollment page. This study was exempt from requiring written informed consent by the Institutional Review Board at the University of California San Francisco. Patients were included if they were 18 years of age; were able to read, write, and understand English; had a diagnosis of cancer; and were able to complete the survey online.

Survey Administration

Emails were sent to potential participants beginning May 27, 2020, and they were asked to complete the survey within 2 weeks. One email reminder was sent 14 days after the initial request. Patients were asked to answer all of the survey questions in relationship to their experiences in the past 14 days. Survey completion times were ~60 minutes. The survey was completed online using the Research Electronic Data Capture (REDCap) system.[17] Responses as of September 10, 2020, are presented in this article.

Instruments

Demographic and clinical characteristics—Patients completed a demographic questionnaire (eg, age, marital status, living arrangements), the Karnofsky Performance Status (KPS) scale,[18] and the Self-Administered Comorbidity Questionnaire (SCQ).[19] In addition, they responded to questions about their height and weight, cancer diagnosis, previous and current cancer treatments, and presence of metastatic disease.

Loneliness measure—The 20-item UCLA Loneliness Scale was designed to measure an individual's subjective feelings of loneliness as well as feelings of social isolation.[14] Each item is rated on a 1 (never) to 4 (often) Likert scale. A score of ~36.0 represents a normative value for the general population.[20] In addition, patients completed the 6-item Social Isolation Scale (SIS).[21]

Symptom measures—The severity of the most common symptoms associated with cancer and its treatment was assessed using Center for Epidemiological Studies–Depression scale (CES-D),[22] Spielberger State-Trait Anxiety Inventories (STAI-S, STAI-T),[23] General Sleep Disturbance Scale (GSDS),[24] Lee Fatigue Scale (LFS; assessed levels of morning and evening fatigue and morning and evening energy),[25] Attentional Function Index,[26] and Brief Pain Inventory.[27]

Data Analysis

Data were downloaded from REDCap[17] into the SPSS Version 27 (IBM Corporation, Armonk, New York). Using the UCLA Loneliness Scale score, patients were dichotomized into the lonely (ie, ≥36) and nonlonely (ie, <36) groups. To determine occurrence rates, symptoms were dichotomized based on clinically meaningful cutoff scores for the various measures. Between group differences were evaluated using parametric and nonparametric tests. Backward conditional logistic regression analysis, using Wald's method, was used to evaluate for predictors of loneliness group membership. A P value of <.05 was considered statistically significant.

RESULTS

Of the 981 patients who began the survey, 606 provided complete information (61.8% completion rate). Characteristics of the total sample and the loneliness groups are presented in Table 1.

Demographic and Clinical Characteristics

Of these 606 patients, 53.0% were categorized in the lonely group. Compared to the nonlonely group, the lonely group was significantly younger, less likely to be married or partnered, more likely to live alone, and reported a lower annual household income. In addition, the lonely group had a significantly lower KPS score, a higher number of comorbidities, and were more likely to self-report a diagnosis of depression and back pain (all P < .05: Table 1).

Loneliness and Social Isolation Scores

The UCLA Loneliness Scale score for the total sample was above the clinically meaningful cutoff score (ie, 38.9 [±12.0]). Compared to the nonlonely group, the lonely group had significantly lower SIS scores (indicating a higher level of social isolation; Table 1).

Symptom Scores

Compared to the nonlonely group, the lonely group had significantly higher occurrence rates for all of the symptoms that were evaluated. In addition, compared to the nonlonely group, the lonely group had significantly higher severity scores for all of the symptoms that were evaluated (ie, depressive symptoms, trait and state anxiety, sleep disturbance, morning and evening fatigue, and pain and pain interference). In addition, they had significantly lower scores (indicating a higher level of symptom severity) for morning and evening energy and attentional function (Table 2).

Factors Associated With Loneliness Group Membership

In the logistic regression analysis, demographic (ie, age, married/partnered, and living alone or with someone) and clinical (ie, SCQ score, KPS score, and diagnosis of back pain) characteristics, SIS score, and dichotomous symptom occurrence groups (ie, CES-D, STAI-T, GSDS, morning and evening fatigue, morning and evening energy, AFI, and presence of pain) that were significantly different between the 2 loneliness groups in the bivariate analyses were included in the model. Although the number of comorbidities and the proportion of patients with a diagnosis of depression, as well as state anxiety scores were significantly different between the 2 loneliness groups, they were not included in the analysis because the total SCQ score and the depression and trait anxiety categorical variables were used in the logistic regression. In addition, income was not included in the regression analysis because of a large amount of missing data (ie, 117 patients did not report their income).

In the final model, 4 variables remained significant (ie, marital status, SIS score, depression group membership, and anxiety group membership; Table 3). Patients who were not married were 2.94 times more likely to be in the lonely group. For each 1-point decrease in the SIS score (higher level of social isolation), patients were 1.52 times more likely to be in the lonely group. Patients who were categorized in the depressed and high trait anxiety groups were 3.24 and 3.17 times more likely, respectively, to be in the lonely group.

DISCUSSION

This study is the first to evaluate for the occurrence of and risk factors associated with loneliness in a relatively large sample of oncology patients during COVID-19. Consistent with a previous report that used the UCLA Loneliness Scale and found occurrence rates for loneliness of 48% and 62% in the general US population during the pandemic,[8] 53% of our oncology patients were in the lonely group. This percentage is higher than the range of 32% to 47% reported by oncology patients before the COVID-19 pandemic.[11–13] Although the mean UCLA Loneliness Scale score for our total sample (ie, 38.9 [±12.0]) was similar to that reported in the meta-analysis of studies of loneliness in oncology patients (ie, 38.3),[10] patients in our lonely group reported a mean score of 48.1 (±8.9). Although 58.9% of our lonely group reported a moderate degree of loneliness (ie, scores of 36–49), 35.8% reported moderately high (ie, scores of 50–64), and 5.3% reported high (ie, scores of 65–79) degrees of loneliness. These percentages are higher than those reported in the meta-analysis of oncology patients (ie, 32%–47% for moderate, 6%–12% for moderately high, 0%–2% for high).[10] These findings suggest that like the general US population, a high percentage of oncology patients are experiencing significant levels of loneliness during COVID-19 that exceed previous benchmarks.

Several demographic characteristics that differed between our loneliness groups in the bivariate, but not in the multivariate analysis, were associated with loneliness in previous studies done before COVID-19. In the general population, loneliness has a U-shaped distribution, with the highest levels of loneliness reported by younger and older adults.[28] However, in a general population study during COVID-19,[6] younger individuals were more likely to report higher rates of loneliness than adults over 65 years of age. Consistent with

our findings, in 1 pre-COVID study of oncology patients,[11] compared to individuals 70 years of age, individuals between 50 and 59 years reported higher levels of loneliness. Older adults may report lower levels of loneliness because they adapt their needs for social contact to the opportunities that are available to them.[29] Across several pre-COVID studies,[12,29] as well as during COVID,[30] lower levels of household income were associated with higher levels of loneliness. One potential explanation is that individuals with higher incomes have more opportunities to engage in social activities and reciprocate in social relationships.[29]

Our findings are consistent with previous pre-COVID studies that did not find any associations between loneliness and disease and treatment characteristics.[10] However, consistent with pre-COVID reports,[2,4,29] a higher comorbidity burden and poorer functional status were associated with higher rates of loneliness. This relationship can be partially explained by the fact that individuals with higher levels of comorbidity and limitations in physical function are less able to engage in social and leisure activities.

Although previous pre-COVID and during-COVID studies found positive associations between loneliness and the symptoms of depression,[4,6,9,31–34] anxiety,[34] fatigue,[31,32] sleep disturbance,[6] pain,[31,32] and cognitive dysfunction,[4,35] our study is the first to evaluate all of these symptoms in the same sample of patients. In our total sample, occurrence rates for all of these symptoms were relatively high ranging from 41.3% for depressive symptoms to 69.3% for decrements in morning energy. However, for every symptom evaluated, compared to the nonlonely group, a significantly higher percentage of patients in the lonely group reported the symptoms. In addition, except for evening fatigue, all of the symptom severity scores in our total sample were above the clinically meaningful cutoff scores. Again, compared to the nonlonely group, patients in the lonely group had statistically significantly worse scores for every symptom. In addition, all of the differences in symptom severity scores represent clinically meaningful differences (ie, Cohen's $d = 0.23$ for worst pain to 1.12 for trait anxiety).[36] As noted on our previous publication on associations between stress and symptoms with an earlier subset of patients (n = 187),[37] all of symptom occurrence rates and severity scores exceed published benchmarks in oncology patients before COVID-19.

In the multivariate analysis, being unmarried, higher levels of social isolation, as well as membership in the high depression and anxiety groups, were significant predictors of membership in the lonely group. In a study of the general population during the COVID-19 pandemic,[6] being separated or divorced was associated with a 2.29 increased risk of being in the lonely group that is comparable to the 2.94 found in our study. In addition, being unmarried/or partnered was an identified risk factor for loneliness in oncology patients before COVID-19.[10]

Our finding, that for each 1-point decrease in SIS score (ie, higher level of social isolation), patients were 1.52 times more likely to be in the lonely group, is consistent with previous research that identified loneliness and social isolation as distinct but related concepts.[3,38,39] Although an individual can have a large social network (objective measure), they can report being lonely (subjective feeling) because they evaluate the quality of these relationships as poor or even threatening.[3] It should be noted that the SIS scores for our lonely group were well above the clinically meaningful cutoff range (ie, <10–15) for being at risk for social

isolation. In fact, only 9.1% of the patients in our lonely group had SIS scores of 15. Future research needs to evaluate the impact of using various types of social media (eg, Facebook, Facetime) on ratings of loneliness and social isolation during and following the COVID-19 pandemic.

Although positive associations between loneliness and depression are well documented,[4,6,9,31–34] fewer studies have evaluated for associations with anxiety.[6,34] In 1 population-based study during the COVID-19 pandemic,[6] meeting clinical criteria for depression, was associated with a 1.74 increase in the odds of being in the lonely group. In our study, meeting the clinical criteria for depressive symptoms was associated with a 3.24 increase in the odds of being in the lonely group. This difference may be related to the fact that in the general population study,[6] only 50.8% of the participants in the lonely group met the criterion for depression, whereas in the current study 64.1% of the patients met this criterion. Although no associations were found in the UK study,[6] in an Israeli study of the general population during COVID-19, being lonely was associated with a 1.61 increase in the odds of being in the high anxiety group. This odds ratio is lower than the 3.17 identified in the current study. It should be noted that 81.9% of our oncology patients were classified as having high levels of trait anxiety.

Several limitations warrant consideration, particularly in terms of the generalizability of the study's findings. Although in some studies women reported higher levels of loneliness,[29,30] given that 91.8% of our sample was female, no conclusions can be drawn about sex differences in loneliness in oncology patients. Given that the sample was primarily females with breast cancer, our findings may not generalize to males and patients with other cancer diagnoses. Although lower income levels were associated with loneliness in our sample, overall the patients were White, well-educated, and reported an annual income of >$60,000. Given the racial/ethnic disparities associated with the COVID-19 pandemic,[40–42] future studies need to evaluate the relationships between loneliness and additional social determinants of health (eg, availability of technology and level of interpersonal and community violence) among both socioeconomically advantaged and socioeconomically disadvantaged individuals. Given the lack of information on the total number of patients who received the survey, as well as on the characteristics of the patients who chose not to complete the survey, our findings may not generalize to all patients with cancer. Given the study's cross-sectional design, no definitive conclusions can be made about the causal relationships between loneliness, social isolation, and symptoms in oncology patients. Longitudinal studies are needed to determine causal relationships as well as interaction effects among loneliness, social isolation, and common symptoms in oncology patients. In addition, studies are needed that evaluate how oncology patients cope with loneliness and how an individual's digital literacy and use of social media influences their levels of loneliness.

In conclusion, several systematic reviews have described the neurobiology of loneliness and its association with negative physical and mental health consequences.[3,38,43] Across these reviews, the authors note that loneliness is a risk factor for increases in morbidity and mortality independent of social isolation. The current working hypotheses for the detrimental effects of chronic loneliness include increased activation of the hypothalamic-

pituitary-adrenal axis[38] and impairments in immune function.[43] How the increased stress associated with COVID-19 and the negative biologic effects of loneliness will impact the course of oncology patients' disease trajectory remains to be determined.

At the present time, it is not entirely clear how long the social distancing procedures initiated during COVID-19 will last. In addition, the long-term impact of the various mitigation procedures on health and well-being remain to be determined. Oncology clinicians need to assess patients, not only for common symptoms, but for their subjective appraisal of loneliness. As noted in a recent commentary,[44] clinicians can suggest a number of strategies to prevent or alleviate the detrimental effects of loneliness. Patients should be encouraged to maintain contacts with family and friends using appropriate social distancing procedures and personal protective equipment and/or using the telephone and various social media platforms. Online video chats may be more beneficial because individuals can respond to visual cues and facial expressions. Clinicians can suggest that patients develop a regular schedule for these social interactions. Second, clinicians can encourage patients to structure their daily routines; engage in outdoor activities when possible, participate in regular physical and mental exercise programs (eg, walking, mindfulness-based practices, music programs), maintain a healthy diet; and obtain a sufficient amount of sleep. Clinicians need to determine when patients may warrant referrals to mental health professionals for psychiatric evaluation and/or counseling. These assessments and suggestions may mitigate some of the negative effects of loneliness on oncology patients' physical and mental health.

FUNDING SUPPORT

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TABLE 1.

Differences in Demographic and Clinical Characteristics Between the Loneliness Groups

Characteristic	Total Sample (n = 606) % (No.)	Nonlonely (47.0% [n = 285]) % (No.)	Lonely (53.0% [n = 321]) % (No.)	Statistics
Demographic and clinical characteristics				
Age, y	62.7 (10.9)	64.3 (10.7)	61.4 (11.0)	t = 3.28, P = .001
No. of people in your household including yourself	2.1 (1.01)	2.1 (0.9)	2.2 (1.1)	t = −0.50, P = .615
Body mass index (kg/m^2)	26.8 (5.9)	26.3 (5.3)	27.2 (6.4)	t = −1.95, P = .052
Karnofsky Performance Status score	91.7 (9.7)	93.1 (8.5)	90.5 (10.6)	t = 3.36, P = .001
No. of comorbidities	1.9 (1.5)	1.6 (1.5)	2.1 (1.6)	t = −3.29, P = .001
Self-administered Comorbidity Questionnaire score	3.8 (3.5)	3.2 (3.2)	4.4 (3.6)	t = −4.01, P < .001
Time since cancer diagnosis, y	9.6 (7.4)	9.9 (7.6)	9.4 (7.2)	t = 0.77, P = .443
No. of previous cancer treatments	2.9 (1.1)	2.9 (1.1)	3.0 (1.1)	t = −0.81, P = .421
No. of current cancer treatments	0.4 (0.7)	0.4 (0.6)	0.5 (0.7)	t = −0.59, P = .555
	% (No.)	% (No.)	% (No.)	
Female (% yes)	91.8 (551)	90.8 (256)	92.8 (295)	FE P = .456
Living arrangements				χ^2 = 0.99, P = .611
Private home or apartment	99.0 (599)	99.3 (282)	98.8 (317)	
Assisted living facility	0.2 (1)	0.0 (0)	0.3 (1)	
Other	0.8 (5)	0.7 (2)	0.9 (3)	
Lives alone (% yes)	23.7 (143)	18.2 (52)	28.5 (91)	FE, P = .003
Married/partnered (% yes)	69.0 (418)	76.8 (219)	62.0 (199)	FE, P < .001
Race/ethnicity				FE, P = .712
White	87.6 (531)	87.0 (248)	88.2 (283)	
Non-White	12.4 (75)	13.0 (37)	11.8 (38)	
Highest level of education				U, P = .719
Grade school	0.2 (1)	0.4 (1)	0.0 (0)	
High school	2.3 (14)	1.4 (4)	3.1 (10)	
Some college	15.0 (91)	13.7 (39)	16.3 (52)	
College graduate	25.8 (156)	28.4 (81)	23.4 (75)	
Some graduate school	11.6 (70)	10.9 (31)	12.2 (39)	

Characteristic	Total Sample (n = 606) % (No.)	Nonlonely (47.0% [n = 285]) % (No.)	Lonely (53.0% [n = 321]) % (No.)	Statistics
Advanced degree	45.1 (273)	45.3 (129)	45.0 (144)	
Currently employed (% yes)	41.9 (252)	41.1 (116)	42.6 (136)	FE, $P = .741$
Annual household income				U, $P < .001$
<$20,000	3.7 (18)	2.7 (6)	4.5 (12)	
$20,000 to $59,000	18.2 (89)	11.6 (26)	23.8 (63)	
$60,000 to $100,000	21.5 (105)	21.0 (47)	21.9 (58)	
>$100,000	56.6 (277)	64.7 (145)	49.8 (132)	
Chronic conditions (% yes)				
Heart disease	9.9 (59)	10.7 (30)	9.2 (29)	FE, $P = .584$
High blood pressure	30.3 (182)	31.0 (88)	29.7 (94)	FE, $P = .723$
Lung disease	6.0 (36)	6.0 (17)	6.0 (19)	FE, $P = 1.000$
Diabetes	5.5 (33)	4.3 (12)	6.6 (21)	FE, $P = .215$
Ulcer or stomach disease	3.9 (23)	2.5 (7)	5.1 (16)	FE, $P = .135$
Kidney disease	2.0 (12)	3.2 (9)	1.0 (3)	FE, $P = .077$
Liver disease	1.7 (10)	1.4 (4)	1.9 (6)	FE, $P = .755$
Anemia or blood disease	5.9 (35)	3.9 (11)	7.7 (24)	FE, $P = .057$
Depression	26.4 (156)	13.0 (36)	38.1 (120)	FE, $P < .001$
Osteoarthritis, degenerative arthritis	32.6 (195)	33.6 (95)	31.6 (100)	FE, $P = .662$
Back pain	32.9 (196)	28.6 (80)	36.8 (116)	FE, $P = .036$
Rheumatoid arthritis	3.3 (19)	2.2 (6)	4.3 (13)	FE, $P = .166$
Cancer diagnosis				$\chi^2 = 7.69$, $P = .262$
Breast cancer	82.8 (496)	79.4 (224)	85.5 (272)	
Gastrointestinal	4.7 (28)	5.7 (16)	3.8 (12)	
Lung	0.2 (1)	0.0 (0)	0.3 (1)	
Malignant melanoma	0.2 (1)	0.4 (1)	0.0 (0)	
Gynecological	1.5 (9)	1.4 (4)	1.6 (5)	
Prostate	3.7 (22)	3.9 (11)	3.5 (11)	
Multiple or other	7.0 (42)	9.2 (26)	5.0 (16)	
Presence of metastatic disease (% yes)	25.4 (150)	24.9 (69)	25.8 (81)	FE, $P = .850$
Currently receiving cancer treatment (% yes)	36.6 (222)	36.8 (105)	36.4 (117)	FE, $P = .933$

Characteristic	Total Sample (n = 606)	Nonlonely (47.0% [n = 285])	Lonely (53.0% [n = 321])	Statistics
	% (No.)	% (No.)	% (No.)	
Tested for COVID-19				$\chi^2 = 1.36, P = .714$
No	76.0 (458)	76.1 (217)	75.8 (241)	
Yes and tested negative	23.4 (141)	23.2 (66)	23.6 (75)	
Yes and tested positive	0.5 (3)	0.4 (1)	0.6 (2)	
Yes and prefer not to report my results	0.2 (1)	0.4 (1)	0.0 (0)	
Loneliness and social isolation scores	Mean (SD)	Mean (SD)	Mean (SD)	
UCLA Loneliness Scale (36)	38.9 (12.0)	28.6 (4.0)	48.1 (8.9)	$t = -35.72, P < .001$
Social Isolation Scale (9 is social isolation; 10–15 at risk for social isolation)	22.8 (4.2)	25.5 (2.7)	20.5 (3.9)	$t = 18.40, P < .001$

Abbreviations: FE, Fisher's exact; SD, standard deviation; U, Mann-Whitney U test.

TABLE 2.

Differences in Symptom Occurrence and Severity Scores Between the Loneliness Groups

Characteristic[a]	Total Sample (n = 606) % (No.)	Nonlonely (47.0% [n = 285]) % (No.)	Lonely (53.0% [n = 321]) % (No.)	Statistics
Symptom occurrence rates				
Depressive symptoms	41.3 (250)	15.8 (45)	64.1 (205)	FE, $P < .001$
Trait anxiety	58.7 (355)	32.6 (93)	81.9 (262)	FE, $P < .001$
State anxiety	48.5 (292)	26.5 (75)	68.0 (217)	FE, $P < .001$
Sleep disturbance	61.8 (373)	46.7 (133)	75.2 (240)	FE, $P < .001$
Morning fatigue	51.5 (311)	34.7 (99)	66.5 (212)	FE, $P < .001$
Evening fatigue	49.0 (296)	35.9 (102)	60.6 (194)	FE, $P < .001$
Decrements in morning energy	69.3 (417)	54.9 (156)	82.1 (261)	FE, $P < .001$
Decrements in evening energy	67.2 (406)	60.7 (173)	73.0 (233)	FE, $P = .001$
Decrements in cognitive function	64.7 (391)	45.4 (129)	81.9 (262)	FE, $P < .001$
Pain	64.5 (386)	59.7 (166)	68.8 (220)	FE, $P = .026$
Symptom severity scores	Mean (SD)	Mean (SD)	Mean (SD)	
Center for Epidemiological Studies–Depression (16)	14.8 (10.4)	8.7 (6.8)	20.2 (10.1)	$t = -16.48$, $P < .001$
Trait anxiety (31.8)	36.3 (11.3)	29.6 (7.0)	42.3 (11.0)	$t = -17.16$, $P < .001$
State anxiety (32.2)	34.9 (13.2)	28.4 (9.5)	40.7 (13.2)	$t = -13.18$, $P < .001$
General Sleep Disturbance Scale (43.0)	50.7 (20.7)	42.8 (19.0)	57.8 (19.6)	$t = -9.50$, $P < .001$
Morning fatigue (3.2)	3.5 (2.5)	2.6 (2.2)	4.3 (2.5)	$t = -9.06$, $P < .001$
Evening fatigue (5.6)	5.3 (2.1)	4.7 (2.1)	5.8 (2.0)	$t = -6.39$, $P < .030$
Morning energy (6.2)	4.8 (2.5)	5.7 (2.4)	4.1 (2.2)	$t = 8.26$, $P < .001$
Evening energy (3.5)	2.9 (2.0)	3.2 (2.2)	2.6 (1.8)	$t = 3.47$, $P = .001$
Attentional Function Index (<5 = low cognitive function, 5–7.5 = moderate cognitive function, >7.5 = high cognitive function)	6.7 (1.9)	7.5 (1.5)	5.9 (1.8)	$t = 11.91$, $P < .001$
Worst pain intensity score	6.5 (2.2)	6.2 (2.1)	6.7 (2.2)	$t = -2.28$, $P = .023$
Mean pain interference score	3.4 (2.3)	2.6 (2.0)	4.0 (2.3)	$t = -6.08$, $P < .001$

Abbreviation: SD, standard deviation.

[a] Clinically meaningful cutoff scores are in parentheses.

TABLE 3.

Logistic Regression Analysis Predicting Loneliness Group Membership (n = 563)

Predictor	Odds Ratio	95% CI	P
Not married/partnered	2.94	1.69–5.00	<.001
Social Isolation Scale score	0.66	0.60–0.72	<.001
Depression group	3.24	1.85–5.67	<.001
Trait anxiety group	3.17	1.86–5.39	<.001

Abbreviations: CI, confidence interval; *df*, degrees of freedom.

Overall model fit: $df = 4$, $\chi^2 = 341.72$, $P < .001$.