Distinct financial distress profiles in patients with breast cancer prior to and for 12 months following surgery

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ABSTRACT

Background Study purposes were to identify subgroups of patients with breast cancer with distinct self-reported financial distress (FD) profiles and determine which demographic, clinical and symptom characteristics, as well as quality of life (QOL) outcomes were associated with subgroup membership.

Methods Patients (n=391) who were assessed for changes in FD a total of 10 times from prior to through 12 months after breast cancer surgery. Latent profile analysis was used to identify subgroups of patients with distinct FD profiles.

Results Three distinct FD profiles (ie, None (14.6%), Low (52.7%), High (32.7%)) were identified. Compared with None and/or Low subgroups, patients in the High subgroup were more likely to report a lower annual household income and performance status; had a higher body mass index, axillary lymph node dissection and more advanced stage disease; had a longer time from cancer diagnosis to surgery; and had received neoadjuvant or adjuvant chemotherapy. In addition, patients in the High subgroup reported higher fatigue, sleep disturbance, state/trait anxiety, depressive symptom scores, and lower attentional function and QOL scores.

Conclusion This study provides new insights on risk factors for and evidence of a higher symptom burden associated with FD. Findings from this study provide clinicians with information on how to identify high-risk patients and to recommend appropriate interventions for both symptom management and FD. Additional research on the mechanisms that underlie the relationships among FD and common physical and psychological symptoms may inform future interventions.

INTRODUCTION

Financial toxicity describes both the objective financial burden and subjective financial distress (FD) from a cancer diagnosis and its treatment.1 Between 28% and 48% of cancer survivors experience financial burden due to direct (eg, out-of-pocket expenses) and indirect (eg, loss of income) costs.2 Depending on a patient’s individual circumstances, cancer diagnosis and treatments, and healthcare system,2 this burden may lead to significant self-reported FD, reduced adherence with treatment, and refusal or discontinuation of treatment.1-3 In recent years, the importance of understanding patients’ perspectives on FD has received growing recognition.4 A determination of interindividual differences in self-reported FD and associated characteristics may provide new insights into modifiable and non-modifiable risk factors.

For patients with breast cancer, three key gaps exist in the FD literature. First, our recent systematic review reported that the financial toxicity literature has focused primarily on using objective measures to quantify financial burden.2 Only a limited number of studies have evaluated FD from the perspectives of patients with breast cancer or identified risk factors associated with this distress.2 4 Only one of these studies used a longitudinal design and evaluated patients’ perceptions of FD in 1502 women with early stage breast cancer in USA over a 4-year period.5 Approximately 25% of these women experienced FD associated with their diagnosis and its treatment. In addition, compared with white women, Spanish-speaking Latino women and black women were at increased risk for FD.5 In our recent...
longitudinal study,6 we used hierarchical linear modelling to evaluate for interindividual differences in self-reported FD in 387 women with breast cancer over 12 months. In this study, women who were younger, had a lower annual household income, had received an axillary lymph node dissection (ALND), had received adjuvant chemotherapy (CTX) and had lower attentional function reported higher levels of FD prior to surgery.

Another gap in the FD literature is a paucity of research that examines the relationships between FD and common symptoms associated with cancer and its treatments.7 An increased understanding of these relationships may inform clinical management. While a clear association was found between FD and psychological symptoms such as depression and anxiety,7 information on the relationships between self-reported FD and common physical symptoms is almost non-existent.7

Finally, while the two longitudinal studies described above3,9 provide some insights into the characteristics associated with FD in patients with breast cancer, the statistical approaches used did not allow for the identification of subgroups of patients with distinct FD profiles. The use of person-centred analytical approaches, like latent profile analysis (LPA), allows for the identification of these subgroups, as well as for the determination of demographic and clinical characteristics associated with subgroup membership. This type of analysis can provide information on high-risk patients who can be targeted for appropriate interventions. Therefore, the purposes of this study were to use LPA to identify subgroups of patients with breast cancer with distinct self-reported FD profiles and to determine which demographic, clinical and symptom characteristics, as well as quality of life (QOL) outcomes, were associated with subgroup membership.

METHODS

Patients and settings
This descriptive, longitudinal analysis is part of a parent study that evaluated for neuropathic pain and lymphoedema in women who underwent breast cancer surgery.4-9 Details on the patients, settings and instruments are described in our previous publications.8 9 Patients were recruited from breast care centres located in a comprehensive cancer centre, two public hospitals and four community practices in Northern California. Patients were eligible to participate if they were: women >18 years of age who would undergo breast cancer surgery on one breast; were able to read, write and understand English; agreed to participate; and gave written informed consent. Patients were excluded if they were having breast cancer surgery on both breasts and/or had distant metastases at the time of diagnosis.

Instruments
At enrolment, patients completed a demographic questionnaire, the Karnofsky Performance Status (KPS) Scale,10 and the Self-Administered Comorbidity Questionnaire.11

As was done in our previous study of employment interference and described in detail in this publication,12 for this study, FD (ie, patients’ perceptions of the distress associated with the financial burden of cancer and its treatments) was evaluated using a single item from the Quality of Life Scale-Patient Version (QOLS-PV).13 Patients were asked to rate the financial burden they had incurred as a result of their illness or treatment, using a 0 (none) to 10 (a great deal) Numeric Rating Scale (NRS). As noted in a recent systematic review,4 most of the studies of patients’ perceptions of FD used a single item (ie, Likert Scale or NRS) and used the term ‘burden’ to perform the subjective evaluation of FD.

The Spielberger State-Trait Anxiety Inventories (STAI-S, STAI-T) were used to assess an individual’s transitory emotional response to a stressful situation and his/her predisposition to anxiety, respectively. Scores for each scale were summed and can range from 20 to 80. Higher scores indicate greater anxiety. Cut-off scores of ≥31.8 and ≥32.2 indicate high levels of trait and state anxiety, respectively.14 Both inventories have well-established validity and reliability.14 In this study, Cronbach’s αs for the STAI-T and STAI-S were 0.88 and 0.95, respectively.

The 20-item Center for Epidemiologic Studies-Depression Scale (CES-D) was used to evaluate the major symptoms in the clinical syndrome of depression. Scores can range from 0 to 60, with scores of ≥16 indicating the need for individuals to seek clinical evaluation. The CES-D has well-established validity and reliability.12 In this study, its Cronbach’s α was 0.90.

The 18-item Lee Fatigue Scale (LFS) was used to assess physical fatigue and energy.16 Each item was rated on a 0 to 10 NRS. Total fatigue and energy scores were calculated as the mean of the 13 fatigue and the 5 energy items. Higher scores indicate greater fatigue severity and higher levels of energy. Patients were asked to rate each item based on how they felt ‘right now’. Cut-off scores of ≥4.4 and ≤4.8 indicate high levels of fatigue and low levels of energy, respectively.17 The LFS has well-established validity and reliability.16 In this study, Cronbach’s αs for the fatigue and energy scales were 0.96 and 0.93, respectively.

The 16-item Attentional Function Index (AFI) was used to assess attentional function.18 Each item was rated on a 0 to 10 NRS. A higher mean score indicates greater capacity to direct attention. Scores are grouped into categories of attentional function (ie, <5.0 low function, 5.0–7.5 moderate function, >7.5 high function).19 The AFI has well-established reliability and validity.16 In this study, its Cronbach’s α was 0.95.
The 21-item General Sleep Disturbance Scale (GSDS) was used to assess the quality of sleep in the past week. Each item was rated on a 0 (never) to 7 (everyday) NRS. The GSDS total score is the sum of the 21 items that can range from 0 (no disturbance) to 147 (extreme sleep disturbance). A GSDS total score of ≥43 indicates a significant level of sleep disturbance. The GSDS has well-established validity and reliability. In this study, its Cronbach’s α was 0.86.

The occurrence of breast pain prior to surgery was determined by asking the question ‘Are you experiencing pain in your affected breast?’ If women responded yes, they rated their average and worst pain using a 0 (no pain) to 10 (worst imaginable pain) NRS. If women experienced pain in your affected breast? If women responded yes, they rated their average and worst pain using a 0 (no pain) to 10 (worst imaginable pain) NRS.

QOL was evaluated using the QOL-PV. The QOL-PV consists of 41 items that measure four domains of QOL in patients with cancer (ie, physical well-being, psychological well-being, social well-being, and spiritual well-being). Items are rated on a 0 to 10 NRS. Mean subscale and total scores were calculated. Higher scores indicate better QOL. The QOL-PV has well-established validity and reliability. Cronbach’s α for the QOL-PV physical well-being, psychological well-being, social well-being, and spiritual well-being, as well as the total QOL score were: 0.80, 0.86, 0.80, 0.63 and 0.86, respectively.

Study procedures
During the patient’s preoperative visit, a clinical staff member explained the study to the patient, determined her willingness to participate and introduced her to the research nurse. The research nurse met with the women, determined eligibility and obtained written informed consent prior to surgery. After obtaining consent, patients completed the enrollment questionnaires an average of 4 days prior to surgery and at 1, 2, 3, 4, 5, 6, 8, 10 and 12 months after surgery. The research nurse met with the patients in the clinical research centre or in their homes. Patients’ medical records were reviewed for disease and treatment information.

Data analysis
Descriptive statistics and frequency distributions were computed for sample characteristics, symptom severity scores and QOL scores using SPSS V23 (IBM, Armonk, New York, USA). As described in detail in our previous publication, unconditional LPA was used to identify the profiles of self-reported FD that characterised unobserved subgroups (ie, latent classes) of patients over the 12 months of the study. First, all of the patients who reported a 0 for the FD item across the 10 assessments were categorised in the None subgroup. Then, we identified subgroups of patients based on their profiles of means across the 10 assessments for the FD item from the QOL-PV. In order to incorporate the expected correlations among the repeated measures, we included covariance among the FD scores that were up to four occasions apart (ie, a covariance structure with a lag of 4). In this way, we retained the within-person correlation among the self-reported FD scores, while we focused on the profiles of means that distinguished the latent classes. We limited the covariance structure to a lag of 4 to accommodate the expected reduction in correlation that would be introduced by decreased stability in the distress reports as the separation of months increased and to reduce model complexity.

As described in detail in our previous publication, estimation was carried out with full information maximum likelihood with standard errors and a χ² test that are robust to non-normality and non-independence of observations (‘estimator=maximum likelihood ratio’). Model fit was evaluated to identify the best solution that characterised the observed latent class structure with the Bayesian information criterion (BIC), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR) for the K vs K–1 model, entropy and latent class percentages that were large enough to be reliable (ie, likely to replicate in new samples). Missing data were accommodated with the use of the expectation-maximisation algorithm. Mixture models, like LPA, are known to produce solutions at local maxima. Therefore, our models were fit with from 800 to 1600 random starts. This approach ensured that the estimated model was replicated many times and was not due to a local maximum. Estimation was done with Mplus V7.2.

After identifying the latent class solution that best fit the data, differences among the latent classes, in demographic and clinical characteristics, symptom scores, and QOL scores were evaluated using analyses of variance, and χ² and Kruskal-Wallis analyses. A value of p<0.05 was considered statistically significant. Post hoc contrasts were done using a Bonferroni corrected p value of <0.017 (0.05/3 pairwise comparisons).

RESULTS

Latent profile analysis
Data from 391 patients with breast cancer were used in the LPA. As shown in figure 1, 14.6% of patients (n=57) did not report any FD for all of the assessments and were named the None class. In the remaining 334 patients, two distinct latent classes were identified. A two-class model was selected because its BIC was lower than the BIC for the one-class solution (table 1). VLMR was statistically significant for the two-class solution, indicating that two classes fit the data better than one class. Although the BIC was smaller for the three-class solution, the model included a latent class with only 15 cases (<5% of the sample), which suggests that the three-class solution may be unreliable across other samples. In addition, VLMR was not significant for the three-class solution, indicating that too many classes were extracted.
As shown in figure 1, the largest proportion of the 334 patients was classified in the Low class (n=206, 52.7%). As a class, this subgroup reported a mean FD score of 1.6 (±2.4) at enrolment, which remained consistent over the 12 months of the study. Patients in the remaining class had a mean FD score of 6.4 (±3.3) at enrolment and were named the High class (n=128, 32.7%). This subgroup’s FD scores were in the moderate to high range with slight fluctuations over the 12 months of the study.

Differences in demographic and clinical characteristics
As shown in table 2, no differences were found among the three subgroups in education, comorbidity, marital status, living arrangement, menopausal status, type of surgery, receipt of sentinel lymph node biopsy, receipt of breast reconstruction at the time of surgery or pain in the affected breast. In addition, no differences were found among the three subgroups in the receipt of radiation therapy, hormonal therapy or complementary therapy, as well as breast reconstruction, re-excision or mastectomy in the 12 months following surgery.

Differences in symptom characteristics
As shown in table 3, no differences were found among the three subgroups in average and worst breast pain intensity scores prior to surgery. At enrolment, significant differences were found among the three subgroups for fatigue and sleep disturbance scores (High>Low>None), as well as for attentional function scores (High<Low<None). Compared with the other two subgroups, patients in the High subgroup reported higher trait anxiety and depressive symptom scores. Compared with the None subgroup, patients in the other two subgroups reported lower energy scores.

Differences in QOL scores
In terms of QOL (see table 4), significant differences were found among the three subgroups in psychological well-being, social well-being and total QOL scores (High<Low<None). Compared with the other two subgroups, patients in the High subgroup had lower physical well-being scores, but higher spiritual well-being scores.

DISCUSSION
This longitudinal study is the first to use LPA, with a relatively large sample of patients with breast cancer, to identify distinct subgroups based on their self-reported perceptions of FD associated with cancer and its treatments. Consistent with the occurrence rate of self-reported FD in women approximately 9 months after their diagnosis of breast cancer, 32.7% of our sample reported moderately high levels of FD prior to surgery that remained constant over the 12 months of the study. In addition, our longitudinal study is the first to use a person-centred analytical approach to identify demographic and clinical characteristics associated with FD and to establish linkages between self-reported perceptions of FD and a higher level of symptom burden.

While in our previous hierarchical linear modeling analysis, we identified 4 non-modifiable (ie, younger age, lower annual household income, receipt of an ALND, receipt of adjuvant CTX) and 1 modifiable (ie, lower level of cognitive function) characteristic associated with higher levels of self-reported FD prior to surgery, the use of a person-centred analytical approach confirmed these 5 characteristics and identified 10 additional characteristics associated with the High subgroup (see online supplementary table 1).

Given the relatively small number of patients (14.6%, n=57) in the None subgroup, the remainder of the...
discussion will focus on differences between the High and the Low subgroups.

In terms of the non-modifiable characteristics, our findings that younger age, lower income and being non-white were characteristics associated with membership in the High FD subgroup are consistent with previous reports in the financial toxicity literature.5 25 Compared with older adults, younger patients face greater pressures adjusting to the financial impact of cancer because they have higher household expenses and have had less time to accumulate assets and wealth.26 In addition, because non-white patients generally have less financial reserves and are less educated,27 they may perceive higher levels of distress when they cannot meet their cancer-related and non-cancer related financial obligations.27

| Characteristic | None (0) | Low (1) | High (2) | Statistics |
|----------------|---------|--------|---------|------------|
| Age (years)    | 62.2 (11.5) | 55.6 (11.5) | 50.9 (9.9) | F=21.27, p<0.001 0>1 > 2 |
| Education (years) | 15.8 (2.1) | 15.9 (2.7) | 15.3 (2.7) | F=1.85, p=0.158 |
| Self-Administered Comorbidity Questionnaire Score | 4.6 (3.2) | 4.0 (2.6) | 4.6 (3.0) | F=2.28, p=0.104 |
| Karnofsky Performance Status Score | 95.8 (9.6) | 94.3 (9.6) | 90.6 (11.0) | F=7.21, p=0.001 1<2 |
| Body mass index (kg/m²) | 26.7 (5.1) | 26.2 (6.0) | 27.9 (6.5) | F=3.09, p=0.047 1<2 |
| Ethnicity: non-white | 19.3 (11) | 31.1 (64) | 46.9 (60) | X²=15.57, p<0.001 0 and 1<2 |
| Married/partnered (% yes) | 40.4 (23) | 37.9 (78) | 46.9 (60) | X²=2.67, p=0.264 |
| Lives alone (% yes) | 28.1 (16) | 20.4 (42) | 25.8 (33) | X²=2.15, p=0.342 |
| Currently employed (% yes) | 33.3 (19) | 54.4 (112) | 44.5 (57) | X²=8.88, p=0.012; 0<1 |
| Annual household income | | | | |
| <$30 000+ | 10.6 (5) | 14.2 (25) | 36.6 (37) | KW, p<0.001 0 and 1<2 |
| $30 000 to <$70 000 | 21.3 (10) | 24.4 (43) | 28.7 (29) |
| $70 000 to <$100 000 | 14.9 (7) | 18.8 (33) | 11.9 (12) |
| >$100 000 | 53.2 (25) | 42.6 (75) | 22.8 (23) |
| Gone through menopause prior to surgery (% yes) | 77.2 (44) | 64.1 (132) | 61.7 (79) | X²=4.41, p=0.110 |
| Days since cancer diagnosis (mean (SD)) | 59.8 (68.8) | 63.8 (79.7) | 83.8 (74.3) | KW, p=0.018 1<2 |
| Days since cancer diagnosis (median) | 39.0 | 36.0 | 46.5 |
| Stage of disease | | | | |
| Stage 0 | 14.0 (8) | 23.8 (49) | 12.5 (16) | KW, p=0.001 1<2 |
| Stage I | 49.1 (28) | 39.8 (82) | 31.3 (40) |
| Stages IIa and IIb | 31.6 (18) | 31.1 (64) | 43.0 (55) |
| Stages IIIa, IIIb, IIIc and IV+ | 5.3 (3) | 5.3 (11) | 13.3 (17) |
| Type of surgery | | | | |
| Breast conservation | 78.9 (45) | 80.6 (166) | 81.3 (104) | X²=0.13, p=0.935 |
| Mastectomy | 21.1 (12) | 19.4 (40) | 18.8 (24) |
| Sentinel lymph node biopsy (% yes) | 86.0 (49) | 85.0 (175) | 78.1 (100) | X²=3.04, p=0.218 |
| Axillary lymph node dissection (% yes) | 31.6 (18) | 28.2 (58) | 53.1 (68) | X²=21.94, p<0.001 0 and 1<2 |
| Underwent resection at the time of surgery (% yes) | 17.5 (10) | 25.2 (52) | 18.8 (24) | X²=2.71, p=0.258 |
| Received neoadjuvant therapy (% yes) | 14.0 (8) | 16.0 (33) | 28.9 (37) | X²=9.67, p=0.008; 1<2 |
| Pain in the affected breast prior to surgery (% yes) | 17.5 (10) | 27.2 (56) | 31.3 (40) | X²=3.75, p=0.153 |
| Received radiation therapy during the 12 months following surgery (% yes) | 66.7 (38) | 72.3 (149) | 71.1 (91) | X²=0.70, p=0.076 |
| Received chemotherapy during the 12 months following surgery (% yes) | 28.1 (16) | 30.1 (62) | 43.8 (56) | X²=7.67, p=0.022; 1<2 |
| Received hormonal therapy during the 12 months following surgery (% yes) | 56.1 (32) | 62.6 (129) | 57.8 (74) | X²=1.20, p=0.549 |
| Received complementary therapy in the 12 months following surgery (% yes) | 26.3 (15) | 34.0 (70) | 34.4 (44) | X²=1.35, p=0.509 |
| Had breast reconstruction in the 12 months following surgery (% yes) | 7.0 (4) | 15.0 (31) | 8.6 (11) | X²=4.62, p=0.099 |
| Had re-excision or mastectomy on the affected breast in the 6 months following surgery (% yes) | 22.8 (13) | 29.1 (60) | 35.2 (45) | X²=3.08, p=0.214 |

+, reference group; KW, Kruskal-Wallis.
In terms of non-modifiable clinical characteristics, longer time from diagnosis to surgery, as well as the receipt of an ALND and receipt of neoadjuvant and adjuvant CTX are consistent with the finding that patients in the High FD subgroup were diagnosed with more advanced stage disease. As noted in a systematic review,\(^28\) all of these characteristics were associated with higher levels of objective financial burden and self-reported FD in cancer survivors. While these characteristics are not modifiable, they can be used by clinicians to identify patients who are at higher risk for persistent FD and may allow them to make appropriate referrals prior to or immediately following surgery.

Two additional clinical characteristics (ie, higher BMI, lower performance status) were associated with membership in the High subgroup. While these characteristics may not be directly related to FD or modifiable prior to surgery, they are added sources of stress for patients with breast cancer and are amenable to interventions during and following cancer treatment. For example, the BMI of patients in the High subgroup is in the overweight to obese range\(^29\) and warrants referral for weight management. While a statistically significant difference was found in KPS Scores between the Low and High subgroups, both subgroups’ scores were >90. Coupled with the high BMIs in both subgroups, these patients would benefit from education on inexpensive ways (eg, walking) to increase their levels of physical activity and may reduce modifiable sources of stress that may have indirect effects on FD.

The most novel findings from this study are the associations between self-reported FD and lower levels of attentional function, as well as higher levels of trait and state anxiety, fatigue and sleep disturbance. With the exception of fatigue, all of the other symptom severity scores reported by patients in the High subgroup were above the clinically meaningful cut-offs. While the mechanisms that underlie the relationships between higher levels of FD and a higher symptom burden are not well understood,\(^30\) it is reasonable to hypothesise that FD is a significant source of stress that contributes to an increased symptom burden.\(^31\) A growing body of preclinical and clinical evidence, although limited, suggests that the stress associated with cancer and its treatments contributes to the increased occurrence and/or severity of fatigue,\(^32\) \(^33\) sleep disturbance,\(^34\) \(^36\) and cognitive impairment.\(^37\) Our findings suggest that self-reported FD is another significant stressor associated with cancer and its treatments that contributes to a higher symptom burden. Whether interventions

### Table 3 Differences in symptom severity scores among the financial distress latent classes at enrolment

| Symptom*                                      | None (0) (n=57) | Low (1) (n=206) | High (2) (n=128) | Statistics |
|-----------------------------------------------|-----------------|-----------------|------------------|------------|
| Trait Anxiety Score (>31.8)                   | 34.0 (8.9)      | 34.3 (8.1)      | 37.5 (9.5)       | F=6.05, p=0.003 0 and 1<2 |
| State Anxiety Score (>32.2)                   | 39.6 (12.1)     | 39.9 (13.0)     | 44.5 (13.5)      | F=5.43, p=0.005 1<2 |
| Center for Epidemiologic Studies-Depression Scale Score (>16.0) | 10.4 (8.4) | 13.0 (9.2) | 16.0 (10.4) | F=7.61, p=0.001 0<1 and 2 |
| Lee Fatigue Scale-Fatigue Score (>4.4)        | 1.6 (1.6)       | 3.0 (2.2)       | 3.7 (2.5)        | F=18.79, p<0.001 0<1<2 |
| Lee Fatigue Scale-Energy Score (<4.8)         | 5.9 (2.7)       | 4.8 (2.3)       | 4.6 (2.5)        | F=5.25, p=0.006 0<1<2 |
| Attentional Function Index Score (<5.0 is low, 5.0–7.5 is moderate, >7.5 is high) | 7.7 (1.8) | 6.7 (1.8) | 6.0 (2.0) | F=17.35, p<0.001 0<1>2 |
| General Sleep Disturbance Scale Score (>43.0) | 37.3 (19.7) | 47.2 (20.0) | 54.5 (21.9) | F=14.15, p<0.001 0<1<2 |
| Average Pain Intensity Score in the breast prior to surgery | 0.5 (1.6) | 0.4 (1.0) | 0.8 (1.7) | KW=3.11, p=0.212 |
| Worst Pain Intensity Score in the breast prior to surgery | 0.6 (1.7) | 0.8 (1.5) | 1.3 (2.4) | KW=4.24, p=0.120 |

*Clinically meaningful cut points for symptom severity are in parentheses.

KW, Kruskal-Wallis.

### Table 4 Differences in quality of life scores among the financial distress latent classes at enrolment

| Quality of life | None (0) 14.6% (n=57) | Low (1) 52.7% (n=206) | High (2) 32.7% (n=128) | Statistics |
|-----------------|-----------------------|-----------------------|------------------------|------------|
| Physical well-being | 8.8 (1.4) | 8.3 (1.3) | 7.2 (1.8) | F=26.58, p<0.001 0 and 1>2 |
| Psychological well-being | 6.7 (1.9) | 6.0 (1.7) | 5.1 (1.8) | F=19.50, p<0.001 0<1>2 |
| Social well-being | 8.5 (1.2) | 7.4 (1.6) | 5.4 (2.0) | F=80.75, p<0.001 0<1>2 |
| Spiritual well-being | 5.3 (1.8) | 5.6 (1.7) | 6.2 (2.0) | F=31.59, p<0.001 0<1>2 |
| Total Quality of Life Score | 7.2 (1.2) | 6.6 (1.2) | 5.8 (1.4) | F=5.25, p=0.006 0<1>2 |
to decrease FD will reduce symptom burden or vice versa remain to be determined.

Consistent with previous reports, except for the spiritual well-being subscale, patients in the High subgroup reported lower scores for all of the domains of QOL, as well as overall QOL. Given that higher levels of FD are associated with lower levels of spiritual well-being except in patients with advanced cancer, a surprising finding was that compared with the other two subgroups, patients in the High subgroup reported higher spiritual well-being scores. This finding may be partially explained by the higher proportion of non-white (46.9%) patients in the High subgroup who are more likely to report higher levels of spiritual well-being, particularly among African-Americans who have a religious and church affiliation.

In terms of study limitations, only women with breast cancer living in USA were evaluated. Therefore, our findings may not generalise to men and/or women with other types of cancer or to other countries with different healthcare systems. In addition, no information was obtained on any financial assistance received; out-of-pocket expenses, or referrals to financial counsellors. Equally important, while our study used a valid and reliable single item to assess FD, future studies should use multidimensional measures of FD. Another limitation is that this study did not collect information on specific types of insurance coverage, which was shown to influence levels of objective financial burden and subsequent levels of self-reported FD. Finally, given the study’s cross-sectional design, causal relationships between FD and decrements in QOL cannot be determined and warrant investigation in longitudinal studies.

In conclusion, this study provides new insights on the relationships between FD and a higher symptom burden. While clinically meaningful cut-off scores for the FD item used in this study are not available, our findings suggest that clinicians who use this single question to assess FD could use a score of \(~6\) to identify higher-risk patients. Future studies need to determine how changes in the severity of symptoms influence changes in FD and vice versa. In addition, the common and distinct mechanisms associated with this significant source of stress and common physical and psychological symptoms associated with cancer and its treatment warrant additional investigations. Equally important is an evaluation of the associations between objective measures of financial burden and increases in symptom severity. These lines of scientific investigation may lead to the development of novel interventions to decrease FD and improve symptom management, particularly in patients with the highest risk for the co-occurrence of these challenging clinical problems.

**Contributors**

RC and CM conceived the study and wrote the initial draft of the manuscript; BC and SP performed the statistical analyses; all of the authors discussed the findings from this study, contributed to several revisions; and approved the final submission of the paper.

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**Patient consent for publication** Obtained.

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**Data availability statement** Data are available upon reasonable request. To access these data, individuals will need to submit a proposal which will be reviewed by the study investigators. If the proposal is accepted, individuals will need to complete a material transfer agreement with the University of California, San Francisco.

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