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Quality of Life of Long-Term Survivors of Breast Cancer and Lymphoma Treated With Standard-Dose Chemotherapy or Local Therapy

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Abstract

Purpose—This study compared the quality of life (QOL) of long-term survivors of breast cancer and lymphoma who had been treated with standard-dose systemic chemotherapy or local therapy only.

Patients and Methods—Long-term survivors (mean, 10.0 ± 5.3 years after treatment) of breast cancer or lymphoma who had been treated with systemic chemotherapy (breast, $n = 141$, age = 57.0 ± 10.1 years; lymphoma, $n = 66$, age = 55.8 ± 13.5 years) or local therapy only (breast, $n = 294$, age = 65.8 ± 9.1 years; lymphoma, $n = 37$, age = 50.4 ± 12.8 years) were interviewed by phone using the Quality of Life–Cancer Survivors Tool.

Results—Multivariate analysis of covariance, controlling for sex, age, education, stage of disease, and time since last treatment, revealed that survivors who had been treated with systemic chemotherapy scored significantly lower on overall QOL compared with survivors treated with local therapy only ($P = .04$). Analysis of covariance on the subscale scores revealed that, compared with survivors who received local therapy, survivors treated with chemotherapy scored significantly lower on the Social subscale ($P < .0001$), but no differences emerged on the Psychological or Spiritual subscales. There was a statistically significant interaction between treatment and diagnosis ($P = .01$), as measured by the Physical subscale, indicating that lymphoma survivors treated with chemotherapy scored worse than all other groups.

Conclusion—Important QOL differences emerged between the chemotherapy and local therapy groups, suggesting that long-term QOL may vary depending on the type of treatment and diagnosis.

INTRODUCTION

Advances in early detection and treatment have led to increasing numbers of long-term survivors of cancer, with the numbers reaching into the millions in the United States and worldwide. As the number of survivors has increased, the interest and research into special issues of survivors, including psychosocial adaptation and quality of life (QOL), have also increased. Generally, research examining QOL of cancer survivors has been quite encouraging

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and has suggested that various domains of QOL for cancer survivors are as good or better than for healthy comparison groups.¹ However, several studies have reported problems for long-term survivors in specific areas, including sexuality,^{2–5} energy level and fatigue,^{5,6} distress,⁷ uncertainty about the future,^{8,9} and cognitive functioning.^{10–13} Conversely, other studies have found positive changes in terms of life priorities and spirituality after cancer diagnosis and treatment.^{14,15}

Reviews of the literature^{1,16} have pointed to several gaps in knowledge, including the facts that the majority of studies has evaluated survivors only 1 to 2 years after treatment and that few studies have examined the impact of various therapies on long-term survivors' QOL and ability to function. The importance of these points is illustrated by the research of Ganz et al,² which evaluated differences in the impact of various adjuvant treatments on health-related QOL and emotional functioning in breast cancer survivors approximately 3 years after treatment. The results demonstrated no significant differences in overall QOL, emotional functioning, or energy and fatigue.² The only significant difference was found on the physical functioning scale of the Short Form-36, where patients who had received no adjuvant treatment showed the highest level of functioning. However, in a follow-up evaluation of this sample of survivors conducted approximately 6 years after treatment,¹⁷ significant differences among treatment groups were found for global QOL, general health, physical functioning, and social functioning. In each case, survivors treated with adjuvant therapy scored worse than survivors not treated with adjuvant therapy. Interestingly, there were no significant group differences for emotional well-being or depression. These data suggest that there may be late effects of chemotherapy across a variety of domains of QOL.

Another issue relates to the use of general measures of QOL versus instruments developed for assessing the QOL of cancer survivors.¹⁸ Use of the more general measures of health-related functioning is important because they allow for direct comparisons with healthy and population controls; however, they may not capture all of the unique issues of cancer survivors. Use of measures that assess specific symptoms evaluate a particular area of concern but do not capture the multiple dimensions of QOL. Therefore, additional research is needed that uses instruments that have been developed specifically for cancer survivors and measure multiple dimensions of QOL.

On the basis of a multicomponent model of QOL that includes the dimensions of physical, psychological, social, and spiritual well-being, Dow et al¹⁹ developed a QOL tool specifically for long-term cancer survivors (Quality of Life–Cancer Survivors Tool [QOL-CS]). This tool has been used to describe the QOL of long-term survivors of breast cancer (> 5 years after diagnosis)²⁰ and lung cancer (> 10 years after diagnosis),¹⁹ although neither study compared the impact of various treatment modalities.

For many people with cancer, the survival advantage of chemotherapy far outweighs the potential long-term side effects. However, understanding the impact of chemotherapy on various domains of QOL is important so that cancer survivors understand the potential consequences of cancer treatment and so that interventions that improve coping with these consequences can be developed. Furthermore, the potential late effects of chemotherapy on QOL make it critical to study long-term survivors of cancer and to compare the various components of QOL of survivors treated with chemotherapy with survivors treated with local therapy only. Additionally, improved early detection techniques and better understanding of prognostic factors has led to certain situations where the potential benefit of adjuvant chemotherapy is inherently small (eg, node-negative breast cancers < 1 cm in diameter).²¹ In this scenario, the long-term consequences of chemotherapy take on increasing importance and may alter treatment decisions made by people with cancer. Therefore, the purpose of the current study was to compare the QOL of long-term survivors (> 5 years after treatment) of breast

cancer and lymphoma who were treated with chemotherapy or local therapy only and were disease free at the time of assessment and who were assessed with an instrument that was specifically designed to evaluate multiple dimensions of QOL of cancer survivors.

PATIENTS AND METHODS

Study Population

Long-term survivors of breast cancer and lymphoma who had been treated at the Norris Cotton Cancer Center (Lebanon, NH) were identified through the Dartmouth-Hitchcock Tumor Registry (Dartmouth-Hitchcock Medical Center, Lebanon, NH). Long-term survivorship was defined as follows: (1) greater than 5 years after diagnosis; (2) 18 years or older at the time of treatment; (3) currently disease free; and (4) currently receiving no cancer treatments. The population was classified into the following two groups: those who had been treated with systemic chemotherapy and those who received local therapy only (ie, local surgery and/or local radiation therapy). Nine hundred ten survivors were identified. Each survivor received a letter describing the purpose of the study from the Tumor Registry. The letter included a box for survivors to check and return if they did not wish to be contacted further about the study. Survivors who did not return the letter declining participation received a telephone call from the study interviewer who described the purpose of the study and conducted a brief screen to confirm diagnosis and current disease status and obtain the date of their last cancer treatment. An appointment to conduct the interview on the telephone was then scheduled with eligible survivors. Discrepancies between the survivor report of diagnosis and current disease status and tumor registry information (8% of the sample) were resolved by chart review. Survivor self-report was found to be correct in all but two patients. Most commonly, the tumor registry, which is most accurate for front-line therapy, listed a survivor as receiving local therapy when, in fact, they had received local therapy initially and then subsequent chemotherapy for a recurrence. For the two patients for whom survivor self-report was incorrect, one survivor reported receiving chemotherapy when she had received radiation therapy only, and one survivor reported receiving radiation only when she had received radiation and chemotherapy. The procedures of this study were approved by the Institutional Review Board of Dartmouth Medical School (Hanover, NH).

One hundred twenty-seven survivors (14%) could not be contacted either because a correct address could not be found or because they could not be reached by telephone. An additional 18 survivors (2%) were determined to be deceased. A total of 171 survivors (19%) declined participation. Of those who declined, 98 (11%) returned the initial letter declining participation, and 73 (8%) declined after being contacted by the study interviewer. Forty-five survivors (5%) were found to be ineligible based on the telephone screen. The remaining 549 survivors completed the interview, yielding a completion rate of 76% (No. of survivors completing the interview ÷ No. of survivors who could be reached and were eligible).

Procedure and Measures

Survivors who agreed to participate were telephoned by a trained research interviewer who collected answers to the following standardized instruments.

Demographic Data Tool.¹⁸—The Demographic Data Tool assesses basic demographic data and treatment and disease-related characteristics (ie, type of cancer therapy and time since cancer diagnosis and end of treatment). Data regarding disease-related characteristics were confirmed by chart review.

QOL-CS.¹⁸—The QOL-CS is a 41-item self-report rating scale that assesses four domains of QOL (physical, psychological, social, and spiritual) on an 11-point scale, with 0 representing

the worst possible outcome and 10 representing the best possible outcome. Strong evidence for the validity and reliability of the instrument has been reported.^{18,19} Cronbach's alphas for the current sample were high for the total score ($\alpha = .83$) and Psychological subscale score ($\alpha = .85$) and moderate for the Physical ($\alpha = .75$), Social ($\alpha = .68$), and Spiritual ($\alpha = .63$) subscale scores.

Statistical Analysis

The impact of chemotherapy on QOL was evaluated using a multivariate analysis of covariance (MANCOVA), with diagnosis and treatment as the between-group factors, diagnosis by treatment as the interaction term, the subscale scores of the QOL-CS tool as the dependent measures, and sex, age, education (less than college v college degree or higher), stage of disease at diagnosis, and time since last treatment as the covariates. Evaluation of marital status as a covariate revealed that it was not significantly related to outcomes and did not change the pattern of results; therefore, it was removed from the model. The MANCOVA was used to first evaluate whether any significant (ie, two-sided $P < .05$) effects existed overall among the four QOL domains. If a significant effect was detected, we then examined each domain separately using analysis of covariance (ANCOVA).

RESULTS

Table 1 lists the information collected from the Demographic Data Tool by treatment and diagnosis. Consistent with the goal of studying long-term survivors, patients in this sample had survived for 10.0 ± 5.3 years after treatment. Survivors who received local therapy were significantly older ($P < .0001$), further away from their last treatment ($P < .0001$), more likely to have been diagnosed with an earlier stage of disease ($P < .001$), and more likely to have been male ($P = .002$) compared with survivors who had received chemotherapy. Also, there was a significant difference between the local therapy and chemotherapy groups on marital status; however, this was confounded by age (ie, survivors in the local breast cancer group, who were significantly older, were more likely to be widowed, divorced, or separated). Although there were no group differences in education level, it is frequently associated with QOL scores and is a surrogate for socioeconomic status. Therefore, subsequent analyses were adjusted for age at interview, time since last treatment, sex, stage of disease, and education.

Table 2 lists the means and standard deviations for the total and subscale scores for the QOL-CS. Overall, the mean total and subscale scores were greater than the midpoint of the scale. The MANCOVA revealed a significant effect for treatment ($P = .04$) but not for diagnosis ($P = .99$). The diagnosis by treatment interaction showed a trend toward significance ($P = .06$). ANCOVA on the subscale scores revealed that, compared with survivors who received local therapy, survivors treated with chemotherapy scored significantly lower on the Social subscale ($P = .001$), but no differences emerged on the Psychological or Spiritual sub-scales. There was a statistically significant interaction between treatment and diagnosis ($P = .01$), as measured by the Physical subscale, indicating that lymphoma survivors treated with chemotherapy scored worse than all other groups in this domain.

Table 3 lists the means and standard deviations for the individual items within each subscale. Analyses for group differences were performed on the individual items; however, we only discuss the items from subscales that demonstrated significant differences in the ANCOVA. For the Physical subscale, there was a significant diagnosis by treatment interaction for fatigue ($P = .02$), aches or pains ($P = .003$), and overall physical health ($P = .01$), indicating that lymphoma patients who had received chemotherapy scored significantly lower on these items compared with the other three groups. There was also a main effect for menstrual and fertility concerns ($P = .01$), indicating that survivors treated with chemotherapy had more concerns.

Inspection of items from the Social subscale revealed that survivors treated with chemotherapy scored significantly lower than patients treated with local therapy on the following: interference with activities at home ($P = .001$) and financial burden ($P = .01$). Additionally, there were significant interactions for concerns about sexuality ($P = .03$) and employment ($P = .01$). Survivors treated with breast cancer who received chemotherapy scored lowest on the sexuality item. Lymphoma survivors treated with chemotherapy scored significantly lower than the other groups on the interference of the cancer and its treatment on employment.

The individual item analysis was presented for descriptive purposes only (ie, there were no specific hypotheses regarding the impact of chemotherapy on specific items). However, it is interesting to note that the only item that remained significant after Bonferroni correction for multiple comparisons ($P = .001$) was problems with activities at home.

Two additional variables were analyzed that could impact on the interpretation of the results; these variables were tamoxifen use and number of chemotherapy regimens received. Of the breast cancer survivors, 82 reported having ever taken tamoxifen (37 chemotherapy survivors and 45 local therapy survivors); however, only seven were taking tamoxifen at the time of the interview (three chemotherapy survivors and four local therapy survivors). A MANCOVA was conducted using ever used tamoxifen versus never used tamoxifen as the independent measure, the subscales of the QOL-CS tool as the dependent measures, and age, time since last treatment, education, and treatment group (chemotherapy *v* local therapy) as covariates. This analysis revealed no significant differences between the ever used tamoxifen and never used tamoxifen groups on the total or subscale scores of the QOL measure.

The majority of survivors who were studied had been treated with one type of chemotherapy regimen only (78%). To examine the potential impact of the amount of chemotherapy received on QOL, survivors treated with chemotherapy were classified into groups defined as one regimen of chemotherapy (eg, cyclophosphamide, doxorubicin, and fluorouracil) or more than one regimen. Comparison of these two subgroups on the total and subscale scores of the QOL instrument, controlling for age, sex, time since last diagnosis, education, and diagnosis, revealed no effect of receiving more than one course of chemotherapy.

DISCUSSION

Long-term effects of cancer and cancer treatments have received increasing research attention. Generally, the research has suggested that cancer survivors return to a high level of QOL that is frequently no different than healthy comparison groups.¹ Overall, data from the current study are consistent with these findings in that the summary scores on the QOL-CS were as good or better than reported in previous studies using this tool.^{9,19} However, studies of survivors 1 to 2 years after treatment have identified problems in specific areas of functioning including sexuality, fatigue, and cognitive functioning. Importantly, Ganz et al¹⁷ studied survivors approximately 6 years after treatment and reported that survivors treated with various forms of adjuvant therapy reported lower levels of functioning in broader domains like global QOL, general health, and physical and social functioning. The current study offers corroborating data in a group of survivors who had, on average, survived 10 years after treatment. Generally, survivors treated with chemotherapy scored significantly lower in the social and physical domains compared with survivors who had received local therapy only. The pattern of results in both studies is also consistent in that neither study found differences by treatment type in the psychological and emotional well-being domains.

In the current study, the effect of chemotherapy is qualified by the presence of an interaction between diagnosis and treatment on the physical subscale. Lymphoma patients treated with chemotherapy scored significantly lower on the physical subscale and on a variety of individual

items (ie, fatigue, aches or pains, and overall physical health). This pattern of results reinforces the importance of studying survivorship issues within various disease groups. The long-term QOL impact of cancer may vary by the pathophysiology of different cancers and/or the effects of disease-specific treatments. However, aside from rates and types of second malignancies after various treatments, long-term side-effect profiles specific to disease and treatment are typically unavailable.²² Comparisons of findings from reviews of lymphoma and breast cancer survivors support the likelihood that, because treatment intensity is greater for the person with lymphoma compared with adjuvant breast cancer treatment, greater long-term side effects in lymphoma survivors, such as those noted in our study, might be expected.²³ Ongoing attention to the long-term effects of chemotherapy is a critical concern given the changes in standard regimens and the introduction of new agents over the last decade.

The one finding that differed between this study and the Ganz et al¹⁷ study was that the latter study found that breast cancer survivors who had not received adjuvant therapy (eg, local therapy $\pm$ tamoxifen) scored significantly better on the physical functioning subscale of the Medical Outcomes Study Short Form-36 compared with survivors who had received some type of systemic therapy. In the present study, no differences emerged between the breast cancer groups who had received chemotherapy or local therapy on the physical subscale. Reasons for this difference are not obvious but may be related to a longer follow-up period in the current study (ie, as survivors age and develop other medical problems, the differences in physical symptoms between survivors receiving chemotherapy and survivors receiving local therapy may diminish) or to differences in the measures used or the populations studied. Nevertheless, the major finding from both of these studies is that treatment with chemotherapy can have long-term consequences on survivors' QOL.

The mean group differences on the domain scores tended to be relatively small, suggesting that the differences are relatively subtle or that there are subgroups of survivors who experience relatively better or poorer QOL. This latter hypothesis is supported by a recent article²⁴ that found different trajectories of recovery from breast cancer over a 4-year period after diagnosis (ie, ranging from stable mental health and physical functioning, as measured on the Short Form-36, to deteriorating functioning over time). Unfortunately, the QOL-CS tool does not yet have clinically meaningful cutoff scores that would allow for an evaluation of the clinical significance of these scores. Clearly, future research will need to focus on identification of subgroups of individuals who experience clinically significant, long-term QOL problems secondary to chemotherapy.

The impact of chemotherapy on the Physical domain is likely related to enduring physical effects caused by cancer treatments.²⁻⁶ However, the impact of chemotherapy on QOL generally and social functioning specifically has not been adequately studied. Survivors treated with chemotherapy, compared with survivors treated with local therapy, reported significantly more problems with sexuality, activities at home, financial burden, and employment problems. Future research is required to examine the mechanism by which chemotherapy is associated with increased problems in social functioning. In part, the lower levels of social functioning in survivors treated with chemotherapy may be related to the changes in sexuality and appearance and cognitive functioning that could impact interpersonal relationships and the ability to work, respectively. In addition, chemotherapy may contribute to increased partner distress, caregiver burden, and so on,²⁵ which sets up problems that persist long after treatment is completed.

The data from this study illustrate the value of using instruments that assess areas that are particularly relevant to cancer survivors and of studying subgroups of survivors who have different diagnoses and receive different forms of treatment. Data like these are relevant for

cancer patients generally, but they are particularly relevant for patients for whom chemotherapy may reduce the chance of recurrence by only a small margin.

The impact of chemotherapy on self-reported QOL has important methodologic implications as well. Increasing numbers of investigators are designing and testing interventions to reduce distress and improve functioning in people with cancer. Because type of treatment (eg, chemotherapy v local therapy) may influence responses on self-reported measures of QOL over the long term, it may be important to balance psychosocial intervention groups and comparison groups in terms of treatment history.

Limitations of the current study include recruitment of survivors from only one institution, a primarily white sample, and a relatively smaller number of lymphoma survivors. All of these factors may limit the generalizability of the results. Additionally, patients were not randomly assigned to treatments; therefore, differences in disease characteristics at diagnosis (ie, patients with more advanced disease are more likely to receive chemotherapy) or personal preferences that were related to the treatment received may have influenced the pattern of results. However, stage of disease at diagnosis was used as a covariate in the analysis and all survivors were free of cancer when they participated in the study; therefore, it seems unlikely that the pattern of results seen could be completely explained by disease or other characteristics at the time of diagnosis.

In summary, use of a cancer-specific instrument revealed significant differences between long-term survivors of breast cancer and lymphoma treated with chemotherapy compared with survivors treated with local therapy only. Importantly, these differences were observed in survivors who had completed treatment approximately 10 years earlier and had, presumably, returned to a normal pattern of life. Additionally, interactions between diagnosis and treatment emerged suggesting that lymphoma patients treated with chemotherapy scored significantly lower in the physical domain compared with the other groups. These data suggest that cancer survivors are not a unitary group and that there may be important subgroups of survivors coping with different QOL issues based on treatment history and diagnosis.

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Table 1

Demographic Characteristics of Breast Cancer and Lymphoma Survivors Treated Either With Chemotherapy or Local Therapy Only

Characteristic	Chemotherapy				Local Therapy				Overall Therapy <i>P</i>
	Breast Cancer (n = 141)		Lymphoma (n = 66)		Breast Cancer (n = 294)		Lymphoma (n = 37)		
	No.	%	No.	%	No.	%	No.	%	
Male, %	0	0.0	30	45.5	3	1.0	18	48.7	.002
Age, years									
Mean	57.0	55.8	65.8	50.4	< .0001				
SD	10.1	13.5	9.1	12.8					
Education									
Less than college	59	41.8	34	52.3	126	42.9	15	40.5	.56
At least some college	82	58.2	31	47.7	168	57.1	22	59.5	
Years since last treatment									
Mean	8.2	9.9	10.5	12.8	< .0001				
SD	4.3	5.4	5.3	6.5					
White, %	137	97.2	64	97.0	293	99.7	37	100.0	.01
Marital status									
Never married	7	5.0	3	4.6	8	2.7	2	5.4	.02
Married/cohabitating	108	76.6	49	74.2	192	65.3	30	81.1	
Widowed/divorced/separated	26	18.4	14	21.2	94	32.0	5	13.5	
AJCC stage									< .001*
0	14	10.2	26	42.6	71	24.9	16	47.1	
I	31	22.6	5	8.2	173	60.7	8	23.5	
II	82	59.9	14	23.0	38	13.3	7	20.6	
III	9	6.6	8	13.1	3	1.1	2	5.9	
IV	1	0.7	8	13.1	0	0.0	1	2.9	
Unknown	4	—	5	—	9	—	3	—	

Abbreviations: SD, standard deviation; AJCC, American Joint Committee on Cancer.

* Comparison of stages 0 to II combined with III and IV combined, excluding unknowns.

Table 2

Mean Total and Subscale Scores From the Quality of Life-Cancer Survivors Tool According to Disease and Treatment

Quality-of-Life Measure	Score								ANOVA <i>P</i> Treatment Effect*	<i>P</i> , Treatment × Diagnosis
	Chemotherapy				Local Therapy					
	Breast Cancer (n = 141)		Lymphoma (n = 66)		Breast Cancer (n = 294)		Lymphoma (n = 37)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
	Physical	8.0	1.4	7.4	1.8	8.2	1.3	8.0		
Psychological	6.6	1.5	6.9	1.6	7.3	1.3	6.8	1.3	.58	—
Social	7.7	1.5	7.2	2.0	8.6	1.0	8.1	1.4	< .0001	—
Spiritual	6.4	1.8	5.9	2.2	5.8	1.8	5.6	1.6	.20	—
Total	7.1	1.0	6.9	1.2	7.5	0.9	7.1	1.1	.08	—

NOTE. MANCOVA treatment, $P = .04$; diagnosis, $P = .99$; treatment × diagnosis interaction, $P = .06$.

Abbreviations: ANOVA, analysis of variance; MANCOVA, multivariate analysis of covariance; SD, standard deviation.

* Adjusted for age at interview, time since last treatment, sex, education, and stage at diagnosis.

Table 3
Means and Standard Deviations of QOL Items According to Treatment and Disease

QOL Item	Chemotherapy				Local Therapy				Overall TX <i>P</i> [*]	TX × DX <i>P</i>
	Breast Cancer (n = 141)		Lymphoma (n = 66)		Breast Cancer (n = 294)		Lymphoma (n = 37)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Physical well-being										
Fatigue	6.8	2.7	5.5	3.1	6.9	2.7	6.6	2.6		.02
Aches/pain	6.8	2.7	5.7	3.0	6.6	2.6	7.0	2.8		.003
Overall physical health	8.0	1.8	7.0	2.5	7.9	1.8	7.6	1.8		.01
Appetite	8.7	2.2	8.5	2.5	9.1	2.0	8.1	2.7	.75	
Sleep	6.6	3.3	6.4	3.3	7.1	2.9	7.7	2.8	.17	
Constipation	8.7	2.2	8.7	2.3	8.7	2.4	8.6	2.7	.65	
Nausea	9.7	0.9	9.2	2.0	9.5	1.5	9.5	1.3	.33	
Menstrual fertility	8.9	2.6	8.6	3.2	9.7	1.3	9.1	2.3	.01	
Psychological well-being										
Concentration/memory	7.0	2.2	6.7	2.5	7.5	1.8	7.4	2.1	.19	
Appearance	6.7	3.2	7.1	3.5	7.6	3.3	8.1	2.6	.04	
CA treatment distress	3.3	3.1	3.3	2.9	5.5	3.4	3.7	3.1	< .004	
Fear of future tests	5.7	3.3	6.8	2.9	6.8	3.1	5.5	3.1	.52	
Fear spread of CA	5.4	3.8	7.4	3.4	7.0	3.2	6.9	3.7	.52	
Coping	8.6	2.2	8.2	2.7	9.0	1.9	8.7	2.2	.19	
QOL single item	8.7	1.7	8.3	2.0	8.6	1.9	8.5	2.1	.95	
Happiness	8.6	1.7	8.3	2.2	8.5	1.9	8.5	1.8	.76	
Control	8.4	1.9	8.2	2.3	8.4	1.9	8.0	2.1	.36	
Satisfaction	8.5	1.7	8.4	1.7	8.4	1.7	8.2	1.9	.21	
Usefulness	8.6	1.6	8.2	1.9	8.4	1.9	8.1	2.2	.29	
Self-concept	7.2	3.3	7.0	3.6	8.0	3.1	6.8	3.4	.89	
Initial DX distress	1.5	2.7	2.3	3.3	2.7	3.3	1.3	2.2	.77	
Time since TX distress	7.0	2.8	7.4	2.9	7.9	2.7	7.5	2.5	.22	
Anxiety	6.1	2.9	6.3	3.3	6.1	2.8	6.0	3.1	.34	
Depression	7.6	2.8	7.6	2.8	7.7	2.4	7.6	3.1	.71	
Fear second CA	5.3	3.5	6.1	3.2	6.3	3.1	5.2	3.4	.53	
Fear recurrent CA	5.3	3.6	6.7	3.3	6.6	3.1	6.3	3.4	.70	
Social well-being										
Family distress	3.4	3.0	3.6	3.5	5.0	3.2	4.2	3.1	.11	
Personal relationships	9.1	2.2	9.0	2.4	9.5	1.8	9.2	2.2	.09	
Sexuality	7.4	3.4	7.6	3.5	8.9	2.4	9.5	1.7		.03
Home activities	8.4	2.7	7.0	3.1	9.3	1.8	8.5	2.6	.001	
Feel isolated	9.0	2.2	8.6	2.7	9.6	1.4	9.0	2.3	.15	
Financial burden	7.3	3.2	6.7	3.7	8.7	2.3	7.6	3.0	.01	
Employment	8.6	2.8	6.8	3.9	9.7	1.2	9.0	2.3		.01
Support/others	8.5	2.5	8.3	3.1	8.5	2.6	7.9	2.2	.56	
Spiritual well-being										
Spiritual change	6.7	2.9	6.6	2.7	6.4	2.7	5.9	2.9	.28	
Positive change	6.1	3.5	4.9	4.1	4.5	3.9	4.8	2.7	.13	
	6.7	3.8	6.0	4.0	6.6	3.8	5.3	3.7	.26	
Important religious activity										
	4.6	4.1	4.4	4.2	4.4	4.0	2.8	3.4	.27	
Important spiritual activity										
Uncertainty	4.1	3.3	3.9	3.3	3.2	3.0	4.3	3.0	.64	
Life purpose	7.5	3.0	7.3	3.5	7.1	3.4	7.5	3.2	.66	
Hopefulness	8.8	1.7	8.4	2.6	8.7	2.0	8.7	1.9	.53	

Abbreviations: QOL, quality of life; TX, treatment; DX, diagnosis; SD, standard deviation; CA, cancer.

* Adjusted for age at interview, time since last treatment, sex, diagnosis, education, and stage at diagnosis.