HHS Public Access

Author manuscript

Psychooncology. Author manuscript; available in PMC 2015 June 13.

Published in final edited form as:

Psychooncology. 2015 June ; 24(6): 643–652. doi:10.1002/pon.3623.

Post-traumatic stress symptoms in cancer survivors: relationship to the impact of cancer scale and other associated risk factors†

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Abstract

Purpose—The purpose of this study was to determine the prevalence of post-traumatic stress symptoms in a sample of cancer survivors and to investigate their association with the impact of cancer, depressive symptoms, and social support.

Methods—We administered a survey to participants in a cancer survivor registry. It included: Post-Traumatic Stress Disorder Checklist-Civilian version (PCL-C), Impact of Cancer Scale (IOC) v.2, and measures of social support, income, and long-term effects of cancer. We performed multivariate analyses to estimate associations between PCL-C and other variables. PCL-C score was examined as a continuous dependent variable and categorically.

Results—Responses were available from 162 cancer survivors. Mean age was 51 years (standard deviation (SD) 16); mean time since diagnosis was 11 years (SD 10). Mean PCL-C score was 27 (SD 9, range 17–64); 29% of the sample scored 30 and above, 13% scored 38 and above, 7%

†Original publication statement: This manuscript is not under consideration elsewhere at this time. A version of this manuscript appears in the doctoral dissertation of Erin E. Hahn, PhD, MPH, filed on ProQuest per University of California Graduate Division guidelines.

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Conflict of interest

The authors report no conflicts of interest and have no financial or personal relationships between themselves and others that might bias this work.

scored 44 and above. Linear regression indicated that PCL-C scores were significantly associated with the IOC negative impact summary scale (NIS) (p <0.001), depressive symptoms (p = 0.003), less social support (p = 0.02), and lower income (p = 0.03). NIS subscale analyses showed that two subscales, life interference (LI) and worry (W), were significantly correlated with PCL-C score (LI: p <0.001; W: p = 0.02).

Conclusions—In this study, the IOC NIS was associated with endorsement of PTSD symptoms. Assessing survivors for PTSD symptoms with the PCL-C could detect those individuals in need of psychosocial support. The IOC may be useful for identifying target areas for interventions to reduce these symptoms among cancer survivors.

Introduction

Post-traumatic stress disorder (PTSD) is a serious anxiety disorder that can affect those exposed to a traumatic event or stressor [1]. These stressors can include life-threatening illnesses such as cancer [1]. Cancer survivors are at risk for many physical and psychosocial long-term effects [2], and the evaluation and treatment of PTSD symptoms is an important part of cancer survivorship care. Allostatic load—the physiological consequences (e.g., elevated blood pressure, cholesterol, and cortisol levels) of exposure to repeated or chronic stress—can be higher in individuals experiencing PTSD symptoms than in those not experiencing PTSD symptoms, highlighting the physical effects of PTSD and demonstrating the need to properly identify and treat this disorder [3]. In addition, overall health care costs and utilization of health care services, including hospitalizations, can be higher in those with PTSD symptoms [4,5]. Unfortunately, identification and treatment of PTSD symptoms and other psychosocial issues in cancer patients and survivors is sub-optimal [6].

The literature on PTSD symptoms in cancer survivors is heterogeneous. A 2002 review of PTSD and cancer demonstrated that the estimated prevalence in cancer survivors varied from 2–32% [7]. This heterogeneity is due in part to use of different instruments to measure PTSD symptoms, including the PTSD module of the Structured Clinical Interview, the PTSD Checklist-Civilian Version, and the Clinician Administered PTSD Scale, as well as use of different scoring methods for the same instrument [7]. Recent studies of breast cancer survivors reflect this variability in estimated prevalence with reports of 2% and 20% [8,9], and studies of other cancer types have also found variability in PTSD prevalence [10–15]. In contrast, the general US population is estimated to have a current past year PTSD prevalence of 3.5% [16]. Associations of demographic, cancer characteristics, and psychosocial variables with PTSD symptoms are not uniform across studies or disease groups (Table 1).

The Impact of Cancer (IOC) instrument was designed to measure both the positive and negative impacts of cancer and its treatments [23]. Physical and mental health outcomes are related to the IOC, as shown in multiple settings and cancer survivor samples [23–25]. Although the positive IOC score (higher score means more positive impacts of cancer) has been strongly associated with post-traumatic growth and meaning [25,26], less is known about the relationship of the negative IOC score as a correlate of PTSD symptoms in cancer patients and survivors. One study of long-term lymphoma survivors found a statistically significant relationship between the IOC negative impact scale and PTSD symptoms [27].

We used an existing database of patients enrolled in a cancer survivorship registry to: (i) determine the number of patients in the sample currently experiencing clinically significant PTSD symptoms in a heterogeneous group of cancer survivors; (ii) examine whether or not cancer history and demographic variables identified in the literature as potential correlates with PTSD symptoms were also found in this cancer survivor sample; and (iii) investigate the relationship between PTSD symptoms and the IOC scales.

Methods

Design and participants

The study sample for this investigation came from the Cancer Survivor Registry (CSR), which was developed by investigators at the University of California Los Angeles Survivorship Center of Excellence (COE) as a resource to advance knowledge about the long-term and late effects of cancer treatment. Participants in the CSR were recruited from the clinical programs of the COE. They were asked to complete a one-time survey that included self-report data on demographics, medical history, health behaviors, and physical and mental health. Cancer survivors seen in the COE survivorship clinics were invited by mailed invitation to participate in the CSR. They were eligible for the study if they were 18 years of age and older, had completed their active cancer treatment (surgery, chemotherapy, and radiation), and were English-speaking. All cancer types were eligible. A questionnaire packet including the informed consent form was mailed to interested participants and the completed packet returned in a postage-paid envelope. There were no monetary incentives to participation. Institutional Review Board approval was received for all study activities (University of California Los Angeles Institutional Review Board approval #10-001256).

Measures

Demographic and cancer characteristics—Demographics include age, gender, race/ethnicity, education, income, and marital status. Cancer characteristics include cancer diagnosis type(s), cancer treatment(s) (surgery, chemotherapy, and radiation), time since diagnosis, and age at diagnosis.

Psychosocial and health-related quality of life measures—Social support was measured with the ENRICHD Social Support Instrument (ESSI), a 7-item self-report instrument [28]. Responses were categorized into high support/low support based on total score, with those scoring 18 or less considered to have low social support, a standard score cut-point. Depressive symptoms were measured using the Center for Epidemiologic Studies Depression instrument (CES-D), a widely used 20-item self-report instrument designed to measure depressive symptomatology in the general population [29]. Responses were categorized into depressed/not depressed based on total score; those scoring 16 or greater were categorized as depressed, a standard score cut-point. The physical (PCS) and mental (MCS) component summary scores from the RAND 36-Item Health Survey (SF-36 v.1) were used as indicators of health-related quality of life [30]. The PCS and MCS are weighted aggregations of the scores for the eight SF-36 subscales and are reported as continuous variables with a mean of 50 and SD of 10 in the US general population.

Post-traumatic stress—Patients completed a commonly used measure of PTSD in the civilian population, the PTSD Checklist-Civilian version (PCL-C) [31]. The PCL-C assesses symptoms in civilian populations using a 17-item self-report checklist. Each symptom is scored on a scale of 1 (low) to 5 (high), and the item scores are summed to a total that ranges from 17 to 85 points. The PCL-C is not a diagnostic measure; rather, it measures clinically significant symptoms of PTSD. Test-retest Pearson product-moment correlation coefficients for the PCL-C ranging from 0.68 to 0.92 and correlations with other established measures (e.g., the Clinician Administered PTSD Scale (CAPS), the Impact of Events Scale) of >0.75 have been reported [32–35]. The sensitivity and specificity of the PCL-C varies by subgroup, creating some uncertainty regarding the optimal scoring cut-points. For example, a widely cited study by Blanchard *et al*. [32] showed that, in adults who had experienced an acute trauma, the optimal scoring cut-point to capture those with PTSD symptoms is 44, a finding replicated by Ruggiero *et al*. [33] However, studies of women enrolled in an HMO insurance plan and older primary care patients have shown optimal cut-points of 30 and 37, respectively [34,35]. The current PCL-C scoring guidelines from the US Department of Veterans Affairs recommend a civilian primary care cut-points of 30–38 for diagnosis of PTSD (www.ptsd.va.gov). Our study examines the PCL-C score as a continuous dependent variable as well as the three PCL-C score cut-points based on the literature and the guidelines from the US Department of Veterans Affairs: 30 and above, 38 and above, and 44 and above. Questions in the PCL-C were slightly modified to focus on cancer-related PTSD (e.g., ‘Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?’ was modified to ‘Repeated, disturbing memories, thoughts, or images from your cancer experience?’).

Impact of cancer—The Impact of Cancer (IOC) scale was developed to measure the unique positive and negative consequences that are associated with being a cancer survivor [23]. The 37-item IOC version 2 was used in this study [25]. The IOC has eight subscales: four positive (Health Awareness, Positive Self-Evaluation, Altruism/Empathy, and Meaning of Cancer) and four negative (appearance concerns (AC), body change concerns (BC), life interference (LI), and worry (W)). These subscales are combined to create the positive impact scale score (PIS) and the negative impact scale score (NIS), respectively. Each negative subscale is made up of either three (AC and BC) or seven questions (LI and W). Topics covered by the subscales include energy and body performance (BC), body disfigurement and appearance (AC), isolation, uncertainty about the future, and cancer-related symptoms (LI), and concerns about cancer recurrence and general health (W). Respondents indicate item agreement using a categorical response scale with a range of 1 (low) to 5 (high). The NIS and PIS were examined in the analyses as well as the four individual negative subscales. Correlations among the IOC v.2 subscales reported elsewhere range from 0.59 to 0.90 [25].

Data analysis

Mean PCL-C scores for the sample were reported along with the percentage of the sample with scores equal to or above the three cut-point values. Bivariate analyses compared mean PCL-C scores by categorical variables using t-tests. Pearson correlations were calculated for the association between the PCL-C total score and continuous variables. Multivariate

models were used to identify variables associated with PCL-C scores. Linear regression was used for the continuous PCL-C score and logistic regression for the variant of the dependent variables created by dichotomizing PCL-C scores using the three score cut-points. A full model was compared with a parsimonious model using the likelihood ratio test to determine if there was additional benefit to including the full set of variables versus only those shown to be at least marginally significant in bivariate analyses (p <0.10). The IOC NIS subscales were included in separate regression analyses to explore the association of PCL-C scores and the individual IOC NIS subscales. All analyses were conducted using Stata version 12.1 [36].

Results

Study sample

Of the 681 survivors who were invited by letter to join the CSR study, 241 indicated interest in participating by contacting study staff by telephone or pre-paid return postcard resulting in an overall response rate of 35%. Of these 241, 166 (69%) returned the completed questionnaire and consent form; the other 75 were lost to follow-up and did not respond to telephone calls or letters from the study coordinator. Study respondents versus non-respondents were more likely to have been diagnosed as an adult than diagnosed as a child before the age of 18 (54% of those diagnosed as an adult responded versus 17% of those diagnosed as a child, p <0.001). Respondents were also more likely to be female (42% of females responded vs. 19% of males, p <0.001) and white (39% white vs. 28% other race/ethnicity, p = 0.004). The final study sample included 162 survivors after excluding four participants who did not complete the PCL-C section of the questionnaire.

The sample characteristics are shown in Table 2. The mean age of the sample was 51 years (standard deviation (SD) 16 years), 27% of the sample was non-white, and the mean time since diagnosis was 11 years (SD 10 years). The mean age at diagnosis was 40 years (SD 20), and the 0–78 age range reflects the inclusion of childhood cancer survivors. Sixty percent were breast cancer survivors, 8% were survivors of adult-onset hematologic cancer (leukemia/lymphoma), and 25% were survivors of childhood cancers diagnosed under the age of 18. Twenty-four percent reported low social support based on the ESSI score, and 27% were categorized as depressed based on the CES-D score. The mean score of the SF-36 PCS was 49, the same as the 2004–2005 US general population mean, and mean score of the MCS was 49, four points lower than the US population mean [37]. The mean IOC NIS was 2.74 (SD 0.77), and the mean IOC PIS was 3.83 (SD 0.64). The overall mean PCL-C score was 27 (SD 9) and 29% of the sample scored 30 and above, 13% scored 38 and above, and 7% scored 44 and above.

Bivariate associations of post-traumatic stress disorder Checklist-Civilian version total score with other variables

Bivariate associations between the PCL-C total score and other variables are listed in Table 3. None of the cancer history variables (treatment type, time since treatment, childhood cancer survivor, and multiple cancer diagnoses) had significant associations with the PCL-C total score. Age, race/ethnicity, income, marital status, health-related quality of life (SF-36

PCS, SF-36 MCS), and psychosocial variables (social support, depressive symptoms, and the IOC NIS) were all statistically significantly associated with the PCL-C total score. The correlations of the PCL-C total score with the IOC NIS ($r = 0.628$, $p < 0.001$) and the SF-36 MCS ($r = -0.620$, $p < 0.001$) were large. In addition, the IOC NIS and SF-36 MCS correlated $r = -0.450$ ($p < 0.05$).

Multivariate regression analyses

Table 4 shows results of multiple linear regression for the total PCL-C score and logistic regression models for the three PCL-C cut-points. The first model is the full multivariate linear regression model with all demographic and cancer history variables included. As seen with the bivariate relationships, only some of the demographic variables and none of the medical characteristic variables are significant in the full model (Model 1, Table 4). Lower income (less than $60,000 per year) and being married were significantly related to higher PCL-C scores ($p = 0.04$ and $p < 0.05$, respectively). In addition, depressive symptoms ($p = 0.005$), lower SF-36 MCS scores ($p = 0.003$), and IOC NIS ($p < 0.001$) were significantly associated with higher PCL-C scores. A parsimonious model with only the mental health-related quality of life (SF-36 MCS), psychosocial variables, and three significantly related demographic variables (income, marital status, and race) was compared with the full model using a likelihood ratio test. The results ($p = 0.9790$) support the parsimonious model (Model 2, Table 4). In the parsimonious linear model, there were significant associations between the total PCL-C score and two demographic variables, lower income ($p = 0.03$), and being married ($p = 0.04$). Four of the five psychosocial and health-related quality of life variables are significant. Those categorized as depressed according to the CES-D have a PCL-C total score 4.59 points higher than those categorized as non-depressed ($p = 0.003$). Those reporting high social support on the ESSI have PCL-C total score 2.43 points lower than those reporting low social support ($p = 0.02$). For every unit increase for the IOC NIS, there is a 4.17 increase in PCL-C total score ($p < 0.001$), and for every unit increase in the SF-36 MCS, there is a 0.21 decrease in the total score. In summary, those who have lower income, are depressed, have low social support, score lower on the SF-36 MCS, and score higher on the IOC NIS are significantly more likely to have higher total PCL-C scores in the parsimonious model.

Logistic regression models were used for the three PCL-C score cut-points to investigate if variables were consistently correlated with the outcome across the three scoring groups (Models 3–5, Table 4). The parsimonious model variables were used as described earlier. The SF-36 MCS was statistically significant in two of the three scoring groups, and the IOC NIS was significant in all three scoring groups. The odds ratios for the IOC NIS are striking. For a one unit increase in the IOC NIS, the odds of being in the score of 30 or greater group increase by a factor of 14.21 ($p < 0.001$). For the score of 38 or greater group, the odds increase by a factor of 7.81 ($p = 0.01$), and for the score of 44 or greater group, the odds increase by a factor of 37.09 ($p = 0.008$).

Exploration of impact of cancer negative subscales

We explored which subscales in the IOC NIS were significantly associated with the PCL-C. The four NIS subscales (AC, BC, LI, and W) were included as independent variables in

linear (outcome variable: PCL-C total score) and logistic (outcome variables: PCL-C score cut-points) regression models with the same parsimonious variable sets as described previously. Two of the subscales, LI and W, were consistently significantly correlated across all four models, with odds ratios ranging from 1.37 to 27.80 (all *p*-values <0.05, data not shown). The confidence intervals became quite large for the estimates in the PCL-C score cut-point groups of 38 and above and 44 and above. This indicates instability, in this case, due to the small cell sizes above threshold for these two cut-points.

Discussion

We found that 7–29% of our sample reported symptoms related to PTSD, depending on scoring method used. We also found that the IOC NIS was significantly associated with reported PTSD symptoms in all three scoring cut-point models. The identification and treatment of PTSD symptoms and other psychosocial issues in cancer patients and survivors is of critical importance and is frequently sub-standard [6]. Our study, which examines PTSD symptoms in a heterogeneous sample of long-term cancer survivors, including an exploration of the relationship between endorsing PTSD symptoms and the IOC, provides information that may be helpful in creating strategies to address this need. We examined two scoring methods for PTSD symptoms, the total score for the PCL-C, and three scoring cut-points. In our study, the mean PCL-C score was 27 (SD 9), and 29% of the sample scored 30 and above, 13% scored 38 and above, and 7% scored 44 and above. The overall percentage of PTSD symptoms in this sample is similar to other study findings, even though this was a convenience sample of cancer survivors at a tertiary referral center. For example, Smith *et al*. reported 8% of non-Hodgkin lymphoma survivors met criteria for PTSD 10 years post-diagnosis ($N = 886$) [10], and two large studies of breast cancer survivors reported 12% and 13% met criteria for PTSD, respectively ($N = 3343$; $N = 1139$) [9,22]. The results from our sample are interesting given that the mean time since diagnosis in this sample is 11 years, indicating that PTSD symptoms may persist in some survivors for many years after the initial cancer diagnosis, or these symptoms develop as a new problem. It is possible that these results reflect distress related to ongoing medical therapy for new or recurrent cancers, or medical complications in those who are childhood cancer survivors. Other studies have found that the prevalence of PTSD symptoms in cancer survivors may decline in the years after cancer treatment but can persist over a long time interval [38,39,21].

In this mixed sample of cancer survivors, demographic factors such as gender, education, and race were not significantly associated with PCL-C scores in bivariate and/ or multivariate analyses. Only marital status and income were significant in the full multivariate regression model, and neither variable remained consistently significant in the scoring cut-point models. The PTSD literature has not shown a consistent pattern regarding demographic variables (Table 1). In the studies shown in Table 1, education was significantly associated with PTSD in five of 10 studies that included education as a variable, and income was significant in three of six studies that included income as a variable. Cancer-specific variables such as cancer type, cancer stage, and treatment type are seldom statistically significantly associated with PTSD symptoms and cancer survivors as reported in the literature. In our study, these and other cancer-related variables (age at

diagnosis, childhood cancer, and multiple cancer diagnoses) were not significantly associated with PTSD symptoms.

The comparison of the full and parsimonious models (Table 4, Models 1 and 2) shows that there is no difference in the explanation of variance between the full model, which includes 6 demographic variables (age, gender, race, education, income, and marital status), seven cancer history variables (age at diagnosis, years since diagnosis, multiple diagnoses, childhood cancer diagnosis, chemotherapy, radiation, and surgery), plus the health-related quality of life and psychosocial variables, and the parsimonious model, which includes only three demographic variables (race, income, and marital status), no cancer history variables, and the health-related quality of life and psychosocial variables.

The health-related quality of life (SF 36-MCS) and psychosocial variables (depression, social support, and IOC NIS) were significantly associated with PCL-C scores in the full and parsimonious linear models with the PCL-C score as a continuous outcome (Table 4). In the three score cut-point models, the SF-36 MCS was statistically significant for two of the three score cut-points, and the IOC NIS was statistically significant at all three score cut-points. The IOC NIS has high odds ratios (7.81–37.09) in all three cut-point models, indicating a substantial relationship with PCL-C scores. These results should be interpreted with caution given sample size, although they are very similar to the findings reported by Smith *et al*. [26]

Our exploration of the IOC NIS subscales revealed that two of the four subscales, LI and W, were consistent significant correlates of high PCL-C scores in each of the four regression models. This is an important finding that needs to be examined in future studies. Example items from these two subscales include the following: ‘I feel like cancer runs my life’ (LI), ‘Having had cancer has made me feel like some people do not understand me’ (LI), ‘I feel like time in my life is running out’ (W), and ‘Having had cancer makes me feel unsure about my future’ (W). Our results are similar to findings by Smith *et al*. who showed that the IOC NIS was strongly associated with PTSD symptoms in a longitudinal study of long-term survivors of non-Hodgkin’s lymphoma [27]. Smith also found that three of the four IOC NIS subscales were significantly associated ($p < 0.05$) with persistent PTSD symptoms: LI, W, and AC [27]. The congruence of findings is important because these content areas of the IOC NIS subscales are issues that could be addressed in survivorship care visits and within primary care, as well as with referral to mental health professionals. The IOC questions are distinct from the PCL-C questions. The PCL-C focuses on re-experiencing, arousal, and avoidance. However, an important next step would be to determine the overlap of concepts between the two measures, especially given the high correlation between the IOC NIS and the PCL-C (0.628). The PCL-C could be an important screening tool for use in clinical practice to identify those who are experiencing PTSD symptoms after cancer treatment.

This study has several limitations, including a cross-sectional survey design, lack of comparison group, a sample of cancer survivors from only one academic medical center, and non-response bias. The cross-sectional design provides only a snapshot of this sample with patients reporting PTSD symptoms experienced at the time of the survey, which limits our ability to conclude that the presumed stressor, cancer, caused the outcome, PTSD symptoms.

However, based on the literature and our study results which indicate that the IOC has a strong relationship with PTSD symptoms, it is reasonable to assume that PTSD symptoms followed the cancer diagnosis. Although the inclusion of a non-cancer comparison group would be useful, the estimates of PTSD in the general population provide a reference estimate. Our sample had higher percentage of patients reporting PTSD symptoms (7–29%, depending on scoring method) than the general US population estimated current past year PTSD prevalence of 3.5% [16]. Our sample is drawn from a single academic center, potentially limiting the generalizability of the results, although similar results regarding the relationship of PTSD symptoms and the IOC NIS have been reported [27]. The sample is also highly educated (74% reported college degree or higher), high income (48% reported income over $100,000), and white, which may also affect the generalizability of our results. Non-response bias is also a potential limitation. The overall response rate was 35%, and responders were more likely to have been diagnosed with cancer as an adult versus diagnosed as a child before the age of 18, more likely to be female, and more likely to be white than non-responders. Based on this, it is difficult to say whether these results reflect over- or under-reporting of PTSD symptoms, although our results are very similar to findings by Smith *et al*. in a larger and more representative sample of lymphoma survivors [26].

In conclusion, we used a standardized assessment tool for detection of PTSD symptoms, finding that PTSD symptoms are a problem for some cancer survivors. In addition, the IOC negative summary scale, a widely used and evaluated cancer-specific survivorship questionnaire, was found to have a strong relationship to endorsing PTSD symptoms in an exploratory analysis, and could be used to direct potential interventions to reduce the negative impacts of cancer. This would assist with the development of standardized methods to identify and treat PTSD symptoms in cancer survivors. The number of patients reporting PTSD symptoms in this sample suggests that the PCL-C should be used to identify cancer survivors at risk for developing PTSD symptoms, and the IOC may be useful for identifying target content areas for future interventions to reduce the burden of post-traumatic stress symptoms in this population.

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Table 1

Correlates of risk factors for developing post-traumatic stress disorder symptoms after cancer as reported in the literature

	Cancer type and sample size; significance at p <0.05 level											
Risk factor	**Breast cancer (*N* = 55) [17]**	**Mixed disease (*N* = 27) [18]**	**Breast cancer (*N* = 82) [19]**	**BMT/SCT survivors (*N* = 236) [20]**	**Head, neck, lung (*N* = 82) [14]**	**Adult survivors of childhood cancer (*N* = 182) [12]**	**NHL (*N* = 886) [10]**	**Adult survivors of childhood cancer (*N* = 6542) [11]**	**Gastric cancer (*N* = 123) [13]**	**Breast cancer (*N* = 3343) [9]**	**Ovarian cancer (*N* = 121) [21]**	**Breast cancer (*N* = 1139) [22]**
Age at study	Significant	NS	—	Significant	NS	NS	Significant	Significant	NS	Significant	Significant	—
Education	Significant	—	NS	NS	—	NS	Significant	Significant	—	Significant	NS	NS
Income	Significant	—	—	NS	—	—	NS	Significant	—	Significant	—	NS
Marital status	NS	—	—	NS	NS	NS	—	Significant	Significant	NS	NS	NS
Race/ethnicity	—	—	—	NS	—	NS	Significant	NS	—	NS	—	Significant
Gender	—	—	—	NS	NS	Significant		NS	Significant	—	—	—
Employment	—	—	—	NS	—	NS		Significant	—	Significant	NS	—
Cancer type	—	NS	—	NS	—	NS	—	NS	—	—	—	—
Cancer stage	NS	NS	Significant	—	—	—	NS	—	NS	—	NS	NS
Time since treatment	NS	NS	Significant	NS	—	NS	Significant	—	—	—	NS	—
Age at diagnosis	—	—	NS	—	—	NS	—	—	—	—	—	Significant
Treatment type	NS	NS	NS	NS	NS	Significant	NS	Significant	—	Significant	NS	NS
Cancer recurrence	—	—	—	—	—	—	NS	NS	—	—	—	—
Social support	—	—	Significant	—	—	—	Significant	—	Significant	—	—	—
Anxiety	—	—	—	—	NS	NS	—	—	-	—	—	—
Depression	—	—	—	—	NS	NS	—	—	Significant	—	—	—
Intrusive thoughts	—	—	—	—	NS	—	—	—	—	—	—	—

NS, non-significant; YA, young adult; BMT, bone marrow transplant; SCT, stem cell transplant.

Table 2

Demographic, medical, health-related quality of life, and psychosocial characteristics of sample, $N = 162$

Variable	Number or percent
Age at enrollment	
Mean	51
SD	16
Range	[18, 88]
Gender	
Male	15%
Female	85%
Race/Ethnicity	
White	74%
Black (non-Hispanic)	3%
Asian (non-Hispanic)	9%
Latino/Hispanic	12%
Other (non-Hispanic)	3%
Years since diagnosis	11
Mean	10
SD	[1, 44]
Range	
Education	
Less than high school	2%
High school graduate/GED	1%
Some college	22%
College graduate	34%
Graduate degree	40%
Income (annual)	
Under $15,000	6%
$16,000–$30,000	7%
$31,000–$60,000	18%
$61,000–$100,000	21%
Over $100,000	48%
Marital status	
Married	55%
Living with partner	7%
Widowed	4%
Divorced	11%
Never married	22%
Age at diagnosis	
Mean	40
SD	20
Range	[0, 78]

Variable	Number or percent
Cancer type	
Breast	60%
Colorectal	1%
Lung	2%
Blood, adult (leukemia/lymphoma)	8%
Adult survivor of pediatric cancer	25%
Other	4%
More than one cancer diagnosis type (% yes)	20%
Cancer treatment	
Surgery	82%
Chemotherapy	70%
Radiation	75%
Low social support (ESSI) (% yes)	24%
Depression (CES-D score of 16 or above) (% yes)	27%
SF-36 PCS	
Mean	49
SD	10
Range	[15, 65]
SF-36 MCS	
Mean	49
SD	11
Range	[13, 66]
Impact of Cancer	
Negative Impact Scale (NIS)	
Mean	2.74
SD	0.77
Positive Impact Scale (PIS)	
Mean	3.84
SD	0.64
PCL-C total score (score 17–85)	
Mean	27
SD	9
Range	[17, 64]
PCL-C cut-points	
Scored 30 and above	29%
Scored 38 and above	13%
Scored 44 and above	7%

SD, standard deviation; ESSI, ENRICHD Social Support Instrument; CES-D, Center for Epidemiologic Studies Depressive Symptoms instrument; SF-36 PCS, Physical Component Summary Score; SF-36 MCS, Mental Component Summary Score; PCL-C, Post-traumatic stress disorder Checklist-Civilian version.

Table 3

Bivariate associations of demographics, cancer history, health-related quality of life, and psychosocial variables with post-traumatic stress disorder Checklist-Civilian version (PCL-C) total score; omnibus test of significance for categorical variables with greater than two categories

		PCL-C score				
Variable	**Number patients**	**Mean**	**Standard deviation**	**Correlation (r)**	***p*-value**	**F-test**
Age at enrollment, years				−0.168	0.03	
Gender						
Male	25	26.2	8.6		0.60	
Female	137	27.2	9.1			
Race/Ethnicity						0.004
White	119	25.9	7.8		0.008	
Non-white	43	30.2	11.1			
Black	4	26.0	6.4		0.82	
Asian	15	31.4	10.2		0.05	
Hispanic/Latino	18	27.7	2.0		0.74	
Other	6	37.2	16.9		0.005	
Years since diagnosis				0.045	0.57	
Education						0.45
Less than high school	3	25.3	4.6		0.74	
High school graduate/GED	2	18	1.4		0.16	
Some college	36	27.3	8.8		0.84	
College graduate	55	26.6	8.3		0.67	
Graduate degree						
Income (annual)						0.003
<$15,000	9	30.2	11.0		0.28	
$16,000–$29,999	11	27.7	8.9		0.80	
$30,000–$59,999	30	32.3	11.7		0.004	
$60,000–$99,999	32	25.3	7.4		0.23	
≥$100,000	78	25.2	7.5		0.01	
Marital status						0.11
Married	91	26.6	9.3		0.50	

		PCL-C score				
Variable	**Number patients**	**Mean**	**Standard deviation**	**Correlation (r)**	***p*-value**	**F-test**
Living with partner	12	23.8	8.2		0.19	
Widowed	5	22.6	6.4		0.27	
Divorced/separated	18	27.5	8.0		0.82	
Never married	36	29.6	8.9		0.05	
Age at diagnosis, years				−0.156	0.05	
Breast cancer						
Yes	96	26.4	9.0			
No	66	27.9	9.1		0.31	
Lung cancer						
Yes	3	33.3	13.6			
No	159	26.9	8.9		0.23	
Blood, adult (leukemia/lymphoma)						
Yes	12	31.83	10.4			
No	150	26.7	8.8		0.07	
Childhood cancer survivor						
Yes	40	27.8	9.0			
No	122	26.8	9.1		0.54	
Multiple diagnoses						
Yes	32	28.0	9.6		0.52	
No	132	26.8	8.9			
Chemotherapy						
Yes	113	27.8	9.1		0.13	
No	49	25.4	8.8			
Radiation						
Yes	121	26.9	9.2		0.75	
No	41	27.4	8.6			
Surgery						
Yes	132	26.8	8.9		0.51	
No	30	28.0	9.8			
Social support (ESSI)						

		PCL-C score				
Variable	**Number patients**	**Mean**	**Standard deviation**	**Correlation (r)**	***p*-value**	**F-test**
High support	123	25.3	7.5		0.000	
Low support	39	32.5	11.2			
Depressive symptom score (CES-D)						
Score less than 16	119	23.7	5.6		0.000	
Score 16 and above	43	36.2	10.1			
SF-36 PCS				−0.374	0.000	
SF-36 MCS				−0.620	0.000	
IOC PIS				0.103	0.191	
IOC NIS				0.628	0.000	

ESSI, ENRICHD Social Support Instrument; CES-D, Center for Epidemiologic Studies Depressive Symptoms instrument; SF-36 PCS, Physical Component Summary Score; SF-36 MCS, Mental Component Summary Score; IOC PIS, Impact of Cancer Positive Impact Summary Score; IOC NIS, Impact of Cancer Negative Impact Summary Score.

Table 4

Multivariate linear and logistic regression of post-traumatic stress disorder Checklist-Civilian version scores, full and parsimonious models

Model 1: full model with continuous PCL-C Score as outcome (R^2 = 0.61)				
	Coefficient	**Standard error**	***p*-value**	**95% confidence interval**
Age at enrollment	−12.34	10.58	0.25	[−33.24, 8.57]
Gender	0.03	1.49	0.99	[−2.93, 2.99]
Non-white race	1.44	1.19	0.23	[−0.92, 3.81]
Years since diagnosis	12.39	10.58	0.24	[−8.53, 33.30]
Education				
< college degree	−0.05	1.43	0.97	[−2.88, 2.77]
College degree	−0.23	1.14	0.84	[−2.49, 2.03]
Annual Income				
<$60k	2.96	1.43	0.04	[0.12, 5.80]
<$99k	0.97	1.30	0.46	[−1.61, 3.55]
Married	2.24	1.16	0.05	[−0.05, 4.54]
Age at diagnosis	12.33	10.57	0.25	[−8.57, 33.22]
Childhood survivor	−0.28	2.58	0.92	[−5.38, 4.83]
Multiple diagnoses	−1.38	1.45	0.34	[−4.25, 1.48]
Chemotherapy	−0.00	1.15	0.99	[−2.27, 2.27]
Radiation	−0.70	1.18	0.55	[−3.04, 1.63]
Surgery	1.09	1.49	0.46	[−1.85, 4.04]
ESSI	−2.42	1.28	0.06	[−4.96, 0.11]
CES-D	4.48	1.59	0.005	[1.34, 7.62]
SF-36 MCS	−0.20	0.07	0.003	[−0.33, −0.07]
IOC PIS	1.06	0.81	0.19	[−0.53, 2.66]
IOC NIS	4.21	0.77	0.000	[2.69, 5.73]

Model 2: parsimonious model with continuous PCL-C Score as outcome (R^2 = 0.61)				
	Coefficient	**Standard error**	***p*-value**	**95% confidence interval**
Non-white race	1.31	1.11	0.24	[−0.90, 3.51]
Annual income				
<$60k	2.75	1.27	0.03	[0.24, 5.25]
<$99k	0.83	1.24	0.51	[−1.62, 3.28]
Married	2.22	1.07	0.04	[0.11, 4.33]
ESSI	−2.44	1.16	0.04	[−4.73, −0.15]
CES-D	4.59	1.51	0.003	[1.6, 7.58]
SF-36 MCS	−0.21	0.06	0.001	[−0.33, −0.09]
IOC PIS	0.80	0.74	0.28	[−0.67, 2.26]
IOC NIS	4.17	0.72	0.00	[2.75, 5.59]
Likelihood ratio test of full model compared to parsimonious model: Prob > chi2 = 0.9790				

Model 3: parsimonious model with bivariate PCL-C Score of 30 or greater as outcome (pseudo R^2 = 0.57)

	Odds ratio	Standard error	*p*-value	95% confidence interval
Non-white race	1.95	1.25	0.29	[0.56, 6.84]
Annual income				
<$60k	1.61	1.22	0.53	[0.36, 7.09]
<$99k	1.07	0.88	0.93	[0.21, 5.40]
Married	1.03	0.67	0.96	[0.29, 3.70]
ESSI	0.16	0.10	0.005	[0.04, 0.58]
CES-D	3.35	2.73	0.14	[0.68, 16.57]
SF-36 MCS	0.91	0.04	0.03	[0.84, 0.99]
IOC PIS	3.07	1.59	0.03	[1.12, 8.47]
IOC NIS	14.21	8.94	0.000	[4.14, 48.75]

Model 4: parsimonious model with bivariate PCL-C Score of 38 or greater as outcome (pseudo R^2 = 0.61)

	Odds ratio	Standard error	*p*-value	95% confidence interval
Non-white race	0.62	0.58	0.61	[0.10, 3.91]
Annual income				
<$60k	21.97	25.40	0.008	[2.28, 211.82]
<$99k	0.57	0.80	0.69	[0.04, 8.94]
Married	3.39	3.07	0.18	[0.58, 19.97]
ESSI	0.81	0.75	0.83	[0.13, 5.00]
CES-D	5.52	5.88	0.11	[0.68, 44.52]
SF-36 MCS	0.89	0.05	0.03	[0.81, 0.99]
IOC PIS	2.98	2.13	0.13	[0.73, 12.10]
IOC NIS	7.81	6.24	0.01	[1.63, 37.38]

Model 5: parsimonious model with bivariate PCL-C Score of 44 or greater as outcome (pseudo R^2 = 0.61)

	Odds ratio	Standard error	*p*-value	95% confidence interval
Non-white race	2.94	3.19	0.32	[0.35, 24.68]
Annual income				
<$60k	27.29	37.61	0.02	[1.83, 403.37]
<$99k	0.86	1.67	0.94	[0.02, 39.37]
Married	24.02	31.93	0.02	[1.78, 325.02]
ESSI	2.89	3.92	0.43	[0.20, 41.12]
CES-D	1.18	1.52	0.90	[0.95, 14.68]
SF-36 MCS	0.90	0.05	0.07	[0.81, 1.01]
IOC PIS	6.27	6.29	0.08	[0.88, 44.86]
IOC NIS	37.09	50.88	0.008	[2.52, 545.46]

Reference groups: annual income: $100k or greater; Education: graduate degree. ESSI, ENRICHD Social Support Instrument; CES-D, Center for Epidemiologic Studies Depressive Symptoms instrument; SF-36 MCS, Mental Component Summary Score; IOC PIS, Impact of Cancer Positive Impact Summary Score; IOC NIS, Impact of Cancer Negative Impact Summary Score.