



Published in final edited form as:

Eur J Cancer Care (Engl). 2018 March ; 27(2): e12833. doi:10.1111/ecc.12833.

Contextual and Stress Process Factors Associated with Head and Neck Cancer Caregivers' Physical and Psychological Well-being

MIN-SO PAEK, PhD,

Assistant Professor, Department of Social Welfare, Konkuk University, S. Korea

CHANDYLEN L. NIGHTINGALE, PhD,

Assistant Professor, Department of Social Sciences and Health Policy, Wake Forest University School of Medicine, Winston-Salem, NC, USA

JANET A. TOOZE, PhD,

Associate Professor, Department of Biostatistical Sciences, Wake Forest University School of Medicine, Winston-Salem, NC, USA

BRANDY-JOE MILLIRON, PhD,

Assistant Professor, Department of Nutrition Sciences, College of Nursing and Health, Drexel University, Philadelphia, PA, USA

KATHRYN E. WEAVER, PhD*, and

Associate Professor, Department of Social Sciences and Health Policy, Wake Forest University School of Medicine, Winston-Salem, NC, USA

KATHERINE R. STERBA, PhD*

Associate Professor, Department of Public Health Sciences and Hollings Cancer Center, Medical University of South Carolina, Charleston, SC, USA

Introduction

A cancer diagnosis may present significant symptoms and treatment-related side effects for patients, necessitating care tasks for informal caregivers such as family members or friends (Girgis, Lambert, Johnson, Waller, & Currow, 2013). In the United States, caregivers caring for patients with cancer are a fundamental source of cancer care. There are at least 2.8 million informal caregivers in the US, who provide care to patients with a primary diagnosis of cancer (National Alliance for Caregiving, 2016). The population of cancer caregivers is expected to increase, in conjunction with a projected dramatic increase in cancer survivors (DeSantis et al., 2014). The vital role that caregivers play is increasingly recognized, and

Correspondence: Min-So Paek, PhD, Department of Social Welfare, Konkuk University, 268 Chungwon-daero, Chungju-si, Chungcheongbuk-do, S. Korea, 27478. mpaek@kku.ac.kr.

*These authors contributed equally to this work.

DR. MIN-SO PAEK (Orcid ID: 0000-0002-9446-8266)

The authors have no conflicts of interest to disclose.

advancing intervention development for cancer caregivers has been deemed a clinical priority for informal cancer caregiving (Kent et al., 2016).

While providing care for a loved one with cancer has been associated with positive outcomes such as personal growth and an enhanced relationship with the care recipient (Li & Loke, 2013), cancer caregivers face a myriad of challenges and are at risk for negative psychological and physical health outcomes (Balfe, O'Brien, et al., 2016; Northouse, Williams, Given, & McCorkle, 2012). For example, cancer caregivers have high unmet needs across the cancer trajectory including psychosocial, medical, daily activity, healthcare service and information needs, and financial needs (Kim, Kashy, Spillers, & Evans, 2010; Longacre, Galloway, Parvanta, & Fang, 2015; Lund, Ross, Petersen, & Groenvold, 2015; Sklenarova et al., 2015), and often enter a caregiving role with little preparation or training (Hashemi-Ghasemabadi, Taleghani, Yousefy, & Kohan, 2016). Anxiety and depression are common in cancer caregivers (40% and 39%, respectively) (Braun, Mikulincer, Rydall, Walsh, & Rodin, 2007; Janda et al., 2007), and studies have shown that cancer caregivers have worse mental and physical well-being when compared to population norms (Butow et al., 2014).

Fletcher et al. (2012) proposed a conceptual model of cancer caregivers' health and well-being, adapted from a previous model proposed in 2000 by Weitzner and colleagues. The updated model has three main interacting components that ultimately contribute to caregiver health and well-being, including contextual factors, the stress process, and the cancer trajectory (Fletcher et al., 2012). Contextual factors include the caregiver's personal, sociocultural, economic, and health care characteristics. The stress process component includes primary (e.g., patient illness factors and caregiving characteristics) and secondary (e.g., spillover effects of caregiving such as employment) stressors, appraisal (e.g., perceived burden), and cognitive-behavioral responses (e.g., self-care and caregiving behaviors) of the caregiver (Fletcher et al., 2012). The cancer trajectory encompasses all stages of a cancer illness beginning with cancer diagnosis and concluding with bereavement or survivorship and acknowledges the different care experiences that may be encountered at different points in the cancer experience (Fletcher et al., 2012). Although the updated model is grounded in a decade of cancer caregiving research (Fletcher et al., 2012), few studies have explored the impact of contextual factors and stress process variables on health and well-being in vulnerable caregiver populations of patients with complicated care regimens (Kent et al., 2016), such as caregivers of patients with head and neck cancer (HNC).

Head and neck cancer includes cancers of the upper aerodigestive tract (larynx, pharynx, nasopharynx, and oral cavity), treated with a combination of surgery, radiation, and chemotherapy (Ward & van As-Brooks, 2014). Treatment for HNC may cause or contribute to disfigurement, impaired speech, difficulty swallowing, and pain (Penner, 2009). Patients commonly experience high levels of psychological distress and report high care demands (Badr, Gupta, Sikora, & Posner, 2014; Chen et al., 2009). Caregivers engage in a variety of tasks related to patient oral care, tube feeding, skin care, speech and voice, tracheostomy care, and more (Bond et al., 2016). Although studies have highlighted vulnerable characteristics among HNC caregivers (Balfe, Butow, et al., 2016; Longacre, Ridge, Burtness, Galloway, & Fang, 2012; Nightingale et al., 2016), there is limited knowledge

regarding contextual factors and stress process variables contributing to HNC caregivers' physical and psychological well-being. Further, little research has focused on caregivers of HNC patients receiving major surgery, and this population of caregivers may have distinct experiences from caregivers of patients receiving other treatment modalities. Increased knowledge regarding factors associated with negative psychological and physical outcomes in HNC caregivers will aid in identifying caregivers most at risk for poor outcomes; further, this knowledge may provide insight regarding potential targets for interventions aimed at improving psychological or physical well-being in HNC caregivers. Thus, the current study examines the following exploratory research question: What are the contextual factors and stress process variables that are associated with physical and psychological well-being in caregivers of patients treated with major surgery for HNC? Figure 1 presents the conceptual model of our research, which is based on Fletcher et al.'s model.

Methods

Participants and procedures

This cross-sectional study was performed in two academic medical centers in North and South Carolina from 2011–2012. The study sample consisted of HNC patients and their nominated caregivers. Patients with HNC were identified using clinic administrative databases for a parent study (Hatcher et al., 2016). Eligible HNC patients for the parent study were: (1) 18 years of age or older, (2) diagnosed with stage I-IV squamous cell carcinoma of the upper aerodigestive tract, (3) scheduled for a major head and neck surgery (i.e., tumor resection, neck dissection, plus or minus reconstruction), and (3) able to read/understand English. A total of 89 HNC patients were participated in the parent study and 43 of them nominated their caregivers to complete a one-time caregiver survey by mail or telephone (Hatcher et al., 2016; Nightingale et al., 2016). Inclusion criteria for the informal caregiver included: (1) nomination by an eligible patient, (2) age 18 years or older, (3) provision of uncompensated care for the nominating patient, and (4) able to read/understand English. Ethics approval for this study was obtained from the institutional review boards of both Wake Forest University School of Medicine and the Hollings Cancer Center. All participants provided informed consent.

Measures

Contextual Factors—Caregiver age, gender, race/ethnicity, education, marital status, and number of comorbidities were collected as contextual factors. Caregiver comorbid conditions were defined as a count of self-reported physician diagnoses of heart disease, stroke, hypertension, diabetes, cancer, chronic obstructive pulmonary disease, asthma, or arthritis (categorized ≤ 2 comorbidities). Patient data collected as contextual factors included age, gender, and race/ethnicity.

Stress Process Variables

Primary and Secondary Stressors: Caregiver characteristics including days per week of care provided (≤ 4 days/week), hours of daily care provided (≤ 5 hours/day), and living with patient (yes/no), were collected as primary stressors. Patient clinical characteristics (i.e., cancer stage, month since diagnosis) were abstracted from patient medical charts.

Patient head and neck cancer-related symptoms and dysfunction were assessed using the European Organization for Research and Treatment of Cancer (EORTC) QLQ-H&N35 (Sherman et al., 2000). This instrument is a reliable and empirically validated scale assessing pain, swallowing, senses, speech, social eating, and social contact with greater scores indicating more problems with each symptom (Sherman et al., 2000). Patient's comorbidity was defined as ≤ 2 or ≥ 2 chronic conditions, based on clinical data from the chart-based medical records (i.e., hypertension, coronary artery disease or congestive heart failure, cerebrovascular disease or peripheral vascular disease, chronic obstructive pulmonary disease, asthma, diabetes, or chronic renal insufficiency). Patient's fatalism about health was measured by five items from a scale reported from a study of cancer (e.g., I've given up trying to get better) with higher scores indicating increased fatalism (Schnoll et al., 2002). Secondary stressors included caregivers' full-time employment status (yes/no), providing child care (yes/no), and short nighttime sleep duration (< 7 hours/night).

Appraisal and Cognitive-Behavioral Responses: Caregiver burden was evaluated using a brief screening version of the Zarit Burden Interview (ZBI) (Bédard et al., 2001). The screening version of the ZBI has scores ranging from 0 to 16 and higher scores reflect more burden. The ZBI has demonstrated excellent internal consistency (Majerovitz, 1995; Zarit, Anthony, & Boutselis, 1987). Caregivers' physical activity (≤ 3 days/week) was collected as a cognitive-behavioral response variable and measured using an item from the Cancer Care Outcomes Research and Surveillance (CanCORS) caregiver study (Ayanian et al., 2004).

Health and Well-being Outcomes

The primary outcomes, physical and psychological well-being, were assessed through reliable and valid self-report instruments. Caregivers' physical well-being was assessed using the Veterans RAND 12-item Health Survey (VR-12) physical component score (PCS) (Ware, Kosinski, & Keller, 1996). The VR-12 has been demonstrated to be valid and reliable (Ware et al., 1996). Possible scores range from 0 to 100, with higher scores indicating better perceived physical health functioning.

We used several instruments to assess caregivers' psychological well-being, including mental health functioning, depressive symptoms, and anxiety. Mental health functioning was measured using the VR-12 mental component score (MCS). Possible MCS scores range from 0 to 100 and higher scores indicate better mental health functioning. Depressive symptoms were assessed using the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10) (Radloff, 1977). The CESD-10 is a widely used depressive symptoms measure and has been shown to be both reliable and valid (Andresen, Malmgren, Carter, & Patrick, 1994; Radloff, 1977). Scores on the CESD-10 range 0 to 30, with higher scores indicating greater depressive symptoms. A cutoff score of ≥ 10 on the CESD-10 has been previously established to denote significant depressive symptoms (Andresen et al., 1994). Caregivers' anxiety was assessed using the 7-item National Institutes of Health (NIH) Patient-Reported Outcomes Measurement Information System (PROMIS) Emotional Distress short form - Anxiety 7a (Pilkonis et al., 2011). The reliability and validity of PROMIS-Anxiety has been well documented (Cella et al., 2010). Raw scores were converted

to t-scores (0-100 scale) with a mean of 50 and SD of 10 (Cella et al., 2010). Higher t-scores indicate greater anxiety.

Data Analysis

Descriptive statistics were conducted to describe sample characteristics. General linear models (GLM) were utilized to test for associations between predictor variables and physical and psychological well-being. Least-squares means (LS means) were estimated for categorical predictor variables. Each outcome variable was analyzed individually. Statistical analyses were conducted with SAS (v 9.4, SAS Institute, Cary, NC). All statistical tests were two-sided and statistical significance was at a 0.05 alpha level.

Results

Sample characteristics

A total of 43 nominated HNC caregivers were invited to participate in this study. The survey response rate was 79% ($n = 34$) for caregivers. The caregiver survey data were linked with patient data. Of the 34 pairs of HNC patients and their caregivers, 33 dyads were included in this study; 1 dyad was ineligible for analyses due to missing data. Socio-demographic, clinical, and caregiving characteristics are shown in Table 1. A majority of caregiver respondents were non-Hispanic White (85.0%) and female (81.8%). Most caregivers were a spouse or partner (72.7%) and lived with the patient (87.9%), were not employed full-time (81.8%), and had less than a college education (66.7%). Most caregivers provided care for 4 days/week (81.8%) and spent < 5 hours/day caring for the patient (75.0%). Over half of the caregivers had 7 hours of sleep/night (57.6%), 66.7% engaged in physical activity on 3 days/week, and 45.5 % had 2 comorbidities. The HNC patient group was predominantly male (84.9%) and had a mean age of 60.1 years. Seventeen patients (51.5%) were diagnosed with AJCC stage IV disease and 16 patients (48.5%) had 2 non-cancer comorbidities. The mean scores of the PCS and MCS for caregivers were 45.8 (SD = 13.6) and 46.8 (SD = 11.7), respectively, which are both slightly lower compared to the general population ($M = 50$, $SD = 10$) (Selim et al., 2009). The mean of caregivers' CESD-10 score was 9.7 (SD = 7.7). The mean t -score of anxiety was 54.1 (SD = 10.2), which is somewhat higher than that of the general population (Cella et al., 2010).

Six factors were significantly associated with caregiver physical well-being in linear models (Table 2). Caregivers' age was positively associated with physical well-being, indicating that older age was associated with better physical well-being ($\beta = .45$, $p < .05$). Caregivers who had < 2 comorbidities had better physical well-being than those with 2 comorbidities (LS mean = 51.4 vs. 39.1, $p < .01$). Positive associations were observed between patients' difficulties with swallowing and speech and caregivers' physical well-being. Providing care for a patient with more swallowing and speech difficulties were each associated with better physical well-being in caregivers (both $\beta = .15$, $p < .05$). The LS mean score on the PCS was significantly higher in caregivers who reported that they slept 7 hours/night than those who slept < 7 hours/night (50.3 vs. 39.8, $p < .05$) and who engaged in 3 days of physical activity/week had better physical well-being than those who did not (49.6 vs. 38.2, $p < .05$).

Only two factors were significantly associated with caregiver mental health functioning, patient's difficulties with social contact and caregiving burden. Providing care for a patient with more social contact problems and having higher caregiving burden were both associated with a poorer mental health functioning in caregivers ($\beta = -.15, p < .05$; $\beta = -1.72, p < .001$, respectively). Older age in caregivers was significantly associated with lower depressive symptoms ($\beta = -.30, p < .05$), whereas providing care for patients with higher levels of pain was associated with more depressive symptoms among caregivers ($\beta = .10, p < .05$). Caregivers with short nighttime sleep duration (< 7 hours) had significantly greater depressive symptoms and anxiety than those with ≥ 7 hours sleep/night (LS mean for CESD-10 = 14.6 vs. 6.1, $p < .001$; LS mean for PROMIS anxiety = 60.0 vs. 49.7, $p < .01$, respectively). Higher caregiving burden was associated with greater depressive symptoms and anxiety ($\beta = 1.15, p < .001$; $\beta = 1.30, p < .001$, respectively). Caregivers who engaged in ≥ 3 days of physical activity/week reported lower depressive symptoms and anxiety than those who did not (LS mean for CESD-10 = 7.3 vs. 14.5, $p < .01$; LS mean for PROMIS anxiety = 50.4 vs. 61.3, $p < .01$, respectively).

Discussion

This study examined factors associated with HNC caregivers' physical and psychological well-being, guided by a comprehensive conceptual model of family cancer caregiving proposed by Fletcher et al. (2012). Better physical well-being among HNC caregivers was associated with older age and having < 2 comorbid conditions (contextual factors), more patient problems with swallowing and speech (primary stressors), longer caregiver nighttime sleep duration (secondary stressor), and more physical activity (cognitive-behavioral response). Better mental health functioning among HNC caregivers was associated with fewer difficulties with social contact (primary stressor) as well as less caregiving burden (appraisal). Both caregiver anxiety and depression were significantly associated with short sleep duration (secondary stressor), caregiving burden (appraisal), and less physical activity (cognitive-behavioral response). Younger caregiver age (contextual) and more patient pain (primary stressor) were additionally related to depressive symptoms.

Previous literature is inconsistent with regard to the relationship between caregivers' age and physical health. Although some caregiver studies have found that older age was related to poorer physical health (Kim & Schulz, 2008; Pinquart & Sörensen, 2007), others have found no significant relationship between age and physical health (Kurtz, Kurtz, Given, & Given, 2004). In this study, caregiver's older age was related to better physical well-being. A potential explanation is that compared to younger caregivers, older caregivers may have less outside competing demands that typically require additional physical effort (e.g., child care) or may have additional help providing care for the patient, resulting in less physical strain. Another potential explanation is that older caregivers may engage in downward social comparison, a process by which the caregiver compares their health to the patient's health, resulting in a more favorable perception of their own health (Taylor & Lobel, 1989). Downward social comparison is more salient in older age (Heckhausen & Krueger, 1993), thus older caregivers may be more likely to engage in this process compared to younger caregivers.

As suggested in other caregiver research (Vitaliano, Katon, & Unützer, 2005; Vitaliano, Zhang, & Scanlan, 2003), HNC caregivers in this study with comorbidities had worse physical well-being. This study also revealed that HNC patient's symptoms, such as difficulties with swallowing and speech, were associated with better physical well-being in caregivers. This finding is somewhat unexpected, because it is generally believed that increased severity in patient symptoms may adversely affect caregivers' health outcomes (Girgis et al., 2013; Nijboer, Triemstra, Tempelaar, Sanderman, & van den Bos, 1999). This result may reflect the possibility that potential gaps exist between severity of HNC patients' perceived symptoms and corresponding levels of patient's dependency on the caregiver for assistance. Similar to findings in other caregiver studies (Burton, Newsom, Schulz, Hirsch, & German, 1997; King & Brassington, 1997), our results showed that shorter nighttime sleep duration and low physical activity were significantly associated with poorer physical well-being. These findings suggest limited sleep and physical activity may result in diminished physical well-being for HNC caregivers, which has previously been suggested for cancer survivors and other types of cancer caregivers (Rock et al., 2012; Speck, Courneya, Mâsse, Duval, & Schmitz, 2010).

In the present study, we observed a significant relationship between a primary stressor (e.g., patient's difficulties with social contact) and worse mental health functioning in caregivers. This finding extends previous studies with HNC patients which have demonstrated that difficulty with social contact is a risk factor for poor mental health outcomes in patients (Psoter, Aguilar, Levy, Baek, & Morse, 2012; Wu et al., 2016). Taken together, findings in this study and others (Psoter et al., 2012; Wu et al., 2016) suggest that patients' difficulties with social contact may contribute to both patient and caregiver mental health. In accordance with other caregiver studies (Chang, Chiou, & Chen, 2010; Grunfeld et al., 2004; Rhee et al., 2008), caregiving burden (included in the appraisal domain) was significantly related to caregiver's mental health functioning, depression, and anxiety. These findings provide preliminary evidence that altering the negative appraisal of the caregiving situation may influence all aspects of psychological well-being among HNC caregivers. Similar to Fletcher et al.'s model (2012), patient and caregiver factors together contributed to HNC caregiver depressive symptoms. Our findings are consistent with prior caregiver research suggesting patient's pain (Kozachik et al., 2001; Sherwood et al., 2006; Weitzner, McMillan, & Jacobsen, 1999), caregiver's younger age (Braun et al., 2007), short nighttime sleep duration in caregivers (Carter, 2002; Carter & Chang, 2000), and caregiver physical inactivity (Castro, Wilcox, O'Sullivan, Baumann, & King, 2002; King & Brassington, 1997; McCurry, Logsdon, Teri, & Vitiello, 2007) as risk factors for caregiver depressive symptoms.

We also observed that a secondary stressor in caregivers (short nighttime sleep duration) and a cognitive-behavioral response (low physical activity) were risk factors for caregiver's anxiety, consistent with results from previous studies (Flaskerud, Carter, & Lee, 2000; Ströhle, 2008). These results taken together suggest that caregiver's nighttime sleep and physical activity are important modifiable factors that may potentially contribute to reductions in both depressive symptoms and anxiety among HNC caregivers. These results suggest that clinicians and healthcare professionals should consider lack of sleep and physical inactivity as critical risk factors. Behavioral-educational intervention programs

targeted at promoting nighttime sleep and encouraging physical activity may be particularly important for decreasing depressive symptoms and anxiety in HNC caregivers.

Among the general caregiver population, empirical evidence suggests the critical importance of various stress process factors in understanding caregiver health outcomes (Haley, LaMonde, Han, Burton, & Schonwetter, 2003; Matthews, Baker, & Spillers, 2003; Pearlin, Mullan, Semple, & Skaff, 1990). Fletcher et al.'s (2012) model was extended to include a comprehensive set of risk and protective factors (e.g., stressors, appraisal, cognitive-behavioral responses, contextual, and cancer trajectory factors) that may contribute to physiological and psychological outcomes of cancer caregivers specifically. The current findings align closely with Fletcher et al.'s model and suggest that the model indeed applies to an understudied HNC caregiver populations. In addition, our findings describe in detail factors affecting each dimension of well-being separately. Given the small sample size, our research is exploratory in nature. However, the current results provide an addition to the relatively scarce research literature in the area of HNC caregivers.

Study Strengths and Limitations

Our study has several notable strengths. First, the current study was carried out exclusively in an understudied population of HNC caregivers. This study, therefore, makes an important contribution towards understanding potential risk factors for poor mental and physical health outcomes among HNC caregivers. Second, this analysis was conducted based on a conceptual model, which is grounded in family caregiving research and provides a scientific basis for understanding family cancer caregivers' health and well-being. The inclusion of a comprehensive group of study variables based on a conceptual framework and the assessment of broader outcomes allowed us to extend our knowledge regarding potential risk and protective factors in HNC caregivers' physical and psychological well-being. Third, the inclusion of both HNC caregivers and patients allowed us to investigate the contribution of both caregiver and patient factors associated with caregivers' physical and psychological well-being.

The current study has some limitations. Although this analysis was guided by a stress process model of caregiving, the cross-sectional design of this study limits causal inferences regarding the stress process and temporal relationships between the study variables and outcomes, and limits the ability to examine the illness trajectory domain of the model. An important limitation of this study is that because of the small sample and large number of study variables, the results should be considered with caution. In addition, the sample may not be representative of the larger population of HNC caregivers. We also relied on a convenience sample of caregivers of HNC patients receiving major surgery who were recruited from two institutions in North and South Carolina. The majority of study participants were female and non-Hispanic White. Further, patients were heterogeneous in terms of their clinical and disease characteristics such as tumor persistence or recurrence, patient's surgery status, primary tumor site (oral cavity, oropharynx, hypopharynx, larynx, and other), and length of time since diagnosis. Consequently, these findings should be interpreted with caution as caregiving experiences are likely to differ based on these clinical factors.

Implications

The findings from this study emphasize the importance of a comprehensive understanding of factors affecting HNC caregivers' physical and psychological well-being. Health care professionals working in areas that serve HNC patients can help caregivers whose lives are more likely to be impacted negatively after caregiving begins. Health care professionals and practitioners should be aware of the risk factors associated with poorer physical and psychological outcomes in HNC caregivers. A better understanding of factors affecting HNC caregivers' outcomes would prove valuable in providing optimal support to HNC caregivers through educational and health promotion interventions, such as encouraging participation in physical activity. This study adds important information to a relatively limited literature base on HNC caregivers and may inform future interventions targeting HNC caregivers. Future studies should include larger and more diverse samples that allow generalization, as well as longitudinal research designs that can support evaluation of the stress process.

Acknowledgments

Research reported in this study was supported by a joint pilot grant from the Comprehensive Cancer Center of Wake Forest University (CCCWFU) and the Hollings Cancer Center at the Medical University of South Carolina. The project was supported by the Biostatistics Core of the CCCWFU, P30 CA012197. Data management support (REDCap) was provided by the Wake Forest School of Medicine Translational Sciences Institute National Center for Research Resources/National Institutes of Health (NCRR/NIH) grant M01RR007122. Min-So Paek and Chandelyn Nightingale's work on this manuscript was partially supported by a Cancer Control Traineeship, National Cancer Institute/National Institute of Health (NCI/NIH; R25CA122061). Katherine Sterba's work on this manuscript was supported by a Mentored Research Scholar Grant in Applied and Clinical Research (MRSG-12-221-01-CPPB) from the American Cancer Society. The authors acknowledge data collection and recruitment support from Rebecca Patten, OT, Lee Anne Tetrack, BS, and Kathryn Josephs, MS.

References

- Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine*. 1994; 10(2): 77–84. [PubMed: 8037935]
- Ayanian JZ, Chrischilles EA, Wallace RB, Fletcher RH, Fouad MN, Kiefe CI, West DW. Understanding Cancer Treatment and Outcomes: The Cancer Care Outcomes Research and Surveillance Consortium. *Journal of Clinical Oncology*. 2004; 22(15):2992–2996. DOI: 10.1200/jco.2004.06.020 [PubMed: 15284250]
- Bédard M, Molloy DW, Squire L, Dubois S, Lever JA, O'Donnell M. The Zarit Burden Interview: A New Short Version and Screening Version. *The Gerontologist*. 2001; 41(5):652–657. DOI: 10.1093/geront/41.5.652 [PubMed: 11574710]
- Badr H, Gupta V, Sikora A, Posner M. Psychological distress in patients and caregivers over the course of radiotherapy for head and neck Cancer. *Oral Oncology*. 2014; 50(10):1005–1011. <http://dx.doi.org/10.1016/j.oraloncology.2014.07.003>. [PubMed: 25091150]
- Balfe M, Butow P, O'Sullivan E, Gooberman-Hill R, Timmons A, Sharp L. The financial impact of head and neck cancer caregiving: a qualitative study. *Psycho-Oncology*. 2016; 25(12):1441–1447. DOI: 10.1002/pon.4079 [PubMed: 26810446]
- Balfe M, O'Brien KM, Timmons A, Butow P, O'Sullivan E, Gooberman-Hill R, Sharp L. Informal caregiving in head and neck cancer: caregiving activities and psychological well-being. *European Journal of Cancer Care (English Language Edition)*. 2016; doi: 10.1111/ecc.12520
- Bond SM, Schumacher K, Sherrod A, Dietrich MS, Wells N, Lindau RH 3rd, Murphy BA. Development of the Head and Neck Cancer Caregiving Task Inventory. *European Journal of Oncology Nursing*. 2016; 24:29–38. DOI: 10.1016/j.ejon.2016.08.004 [PubMed: 27697275]

- Braun M, Mikulincer M, Rydall A, Walsh A, Rodin G. Hidden Morbidity in Cancer: Spouse Caregivers. *Journal of Clinical Oncology*. 2007; 25(30):4829–4834. DOI: 10.1200/jco.2006.10.0909 [PubMed: 17947732]
- Burton LC, Newsom JT, Schulz R, Hirsch CH, German PS. Preventive Health Behaviors among Spousal Caregivers. *Preventive Medicine*. 1997; 26(2):162–169. <http://dx.doi.org/10.1006/pmed.1996.0129>. [PubMed: 9085384]
- Butow PN, Price MA, Bell ML, Webb PM, deFazio A, The Australian Ovarian Cancer Study, G. Friedlander M. Caring for women with ovarian cancer in the last year of life: A longitudinal study of caregiver quality of life, distress and unmet needs. *Gynecologic Oncology*. 2014; 132(3):690–697. <http://dx.doi.org/10.1016/j.ygyno.2014.01.002>. [PubMed: 24423880]
- Carter PA. Caregivers' descriptions of sleep changes and depressive symptoms. *Oncology Nursing Forum*. 2002; 29(9):1277–1283. DOI: 10.1188/02.onf.1277-1283 [PubMed: 12370697]
- Carter PA, Chang BL. Sleep and depression in cancer caregivers. *Cancer Nursing*. 2000; 23(6):410–415. [PubMed: 11128119]
- Castro CM, Wilcox S, O'Sullivan P, Baumann K, King AC. An Exercise Program for Women Who Are Caring for Relatives With Dementia. *Psychosomatic Medicine*. 2002; 64(3):458–468. [PubMed: 12021419]
- Cella D, Riley W, Stone A, Rothrock N, Reeve B, Yount S, Hays R. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. *Journal of Clinical Epidemiology*. 2010; 63(11):1179–1194. <http://dx.doi.org/10.1016/j.jclinepi.2010.04.011>. [PubMed: 20685078]
- Chang HY, Chiou CJ, Chen NS. Impact of mental health and caregiver burden on family caregivers' physical health. *Archives of Gerontology and Geriatrics*. 2010; 50(3):267–271. <http://dx.doi.org/10.1016/j.archger.2009.04.006>. [PubMed: 19443058]
- Chen SC, Tsai MC, Liu CL, Yu WP, Liao CT, Chang JTC. Support Needs of Patients With Oral Cancer and Burden to Their Family Caregivers. *Cancer Nursing*. 2009; 32(6):473–481. DOI: 10.1097/NCC.0b013e3181b14e94 [PubMed: 19816161]
- DeSantis CE, Lin CC, Mariotto AB, Siegel RL, Stein KD, Kramer JL, Jemal A. Cancer treatment and survivorship statistics, 2014. *CA: A Cancer Journal for Clinicians*. 2014; 64(4):252–271. DOI: 10.3322/caac.21235 [PubMed: 24890451]
- Flaskerud JH, Carter PA, Lee P. Distressing Emotions in Female Caregivers of People With AIDS, Age-Related Dementias, and Advanced-Stage Cancers. *Perspectives in Psychiatric Care*. 2000; 36(4):121–130. DOI: 10.1111/j.1744-6163.2000.tb00600.x [PubMed: 12035204]
- Fletcher BS, Miaskowski C, Given B, Schumacher K. The cancer family caregiving experience: an updated and expanded conceptual model. *European Journal of Oncology Nursing*. 2012; 16(4):387–398. [PubMed: 22000812]
- Girgis A, Lambert S, Johnson C, Waller A, Currow D. Physical, Psychosocial, Relationship, and Economic Burden of Caring for People With Cancer: A Review. *Journal of Oncology Practice*. 2013; 9(4):197–202. DOI: 10.1200/jop.2012.000690 [PubMed: 23942921]
- Grunfeld E, Coyle D, Whelan T, Clinch J, Reyno L, Earle CC, Glossop R. Family caregiver burden: results of a longitudinal study of breast cancer patients and their principal caregivers. *Canadian Medical Association Journal*. 2004; 170(12):1795–1801. DOI: 10.1503/cmaj.1031205 [PubMed: 15184333]
- Haley WE, LaMonde LA, Han B, Burton AM, Schonwetter R. Predictors of Depression and Life Satisfaction Among Spousal Caregivers in Hospice: Application of a Stress Process Model [Press release]. 2003
- Hashemi-Ghasemabadi M, Taleghani F, Yousefy A, Kohan S. Transition to the new role of caregiving for families of patients with breast cancer: a qualitative descriptive exploratory study. *Supportive Care in Cancer*. 2016; 24(3):1269–1276. DOI: 10.1007/s00520-015-2906-3 [PubMed: 26306519]
- Hatcher JL, Sterba KR, Tooze JA, Day TA, Carpenter MJ, Alberg AJ, Weaver KE. Tobacco use and surgical outcomes in patients with head and neck cancer. *Head and Neck*. 2016; 38(5):700–706. DOI: 10.1002/hed.23944 [PubMed: 25521527]
- Heckhausen J, Krueger J. Developmental expectations for the self and most other people: Age grading in three functions of social comparison. *Developmental Psychology*. 1993; 29(3):539.

- Janda M, Steginga S, Langbecker D, Dunn J, Walker D, Eakin E. Quality of life among patients with a brain tumor and their carers. *Journal of Psychosomatic Research*. 2007; 63(6):617–623. <http://dx.doi.org/10.1016/j.jpsychores.2007.06.018>. [PubMed: 18061752]
- Kent EE, Rowland JH, Northouse L, Litzelman K, Chou WYS, Shelburne N, Huss K. Caring for caregivers and patients: Research and clinical priorities for informal cancer caregiving. *Cancer*. 2016; 122(13):1987–1995. DOI: 10.1002/cncr.29939 [PubMed: 26991807]
- Kim Y, Kashy DA, Spillers RL, Evans TV. Needs assessment of family caregivers of cancer survivors: three cohorts comparison. *Psycho-Oncology*. 2010; 19(6):573–582. DOI: 10.1002/pon.1597 [PubMed: 19582798]
- Kim Y, Schulz R. Family Caregivers' Strains: Comparative Analysis of Cancer Caregiving With Dementia, Diabetes, and Frail Elderly Caregiving. *Journal of Aging and Health*. 2008; doi: 10.1177/0898264308317533
- King AC, Brassington G. Enhancing physical and psychological functioning in older family caregivers: The role of regular physical activity. *Annals of Behavioral Medicine*. 1997; 19(2):91–100. DOI: 10.1007/bf02883325 [PubMed: 9603683]
- Kozachik SL, Given CW, Given BA, Pierce SJ, Azzouz F, Rawl SM, Champion VL. Improving depressive symptoms among caregivers of patients with cancer: results of a randomized clinical trial. *Oncology Nursing Forum*. 2001; 28(7):1149–1157. [PubMed: 11517848]
- Kurtz ME, Kurtz JC, Given CW, Given BA. Depression and physical health among family caregivers of geriatric patients with cancer—a longitudinal view. *Medical Science Monitor*. 2004; 10(8):Cr447–456. [PubMed: 15277994]
- Li Q, Loke AY. The positive aspects of caregiving for cancer patients: a critical review of the literature and directions for future research. *Psycho-Oncology*. 2013; 22(11):2399–2407. DOI: 10.1002/pon.3311 [PubMed: 23712938]
- Longacre ML, Galloway TJ, Parvanta CF, Fang CY. Medical Communication-related Informational Need and Resource Preferences Among Family Caregivers for Head and Neck Cancer Patients. *Journal of Cancer Education*. 2015; 30(4):786–791. DOI: 10.1007/s13187-015-0814-3 [PubMed: 25893922]
- Longacre ML, Ridge JA, Burtness BA, Galloway TJ, Fang CY. Psychological functioning of caregivers for head and neck cancer patients. *Oral Oncology*. 2012; 48(1):18–25. <http://dx.doi.org/10.1016/j.oraloncology.2011.11.012>. [PubMed: 22154127]
- Lund L, Ross L, Petersen MA, Groenvold M. The interaction between informal cancer caregivers and health care professionals: a survey of caregivers' experiences of problems and unmet needs. *Supportive Care in Cancer*. 2015; 23(6):1719–1733. DOI: 10.1007/s00520-014-2529-0 [PubMed: 25432867]
- Majerovitz SD. Role of family adaptability in the psychological adjustment of spouse caregivers to patients with dementia. *Psychology and Aging*. 1995; 10(3):447–457. [PubMed: 8527065]
- Matthews B, Baker F, Spillers R. Family caregivers and indicators of cancer-related distress. *Psychology, Health & Medicine*. 2003; 8(1):46–56. DOI: 10.1080/1354850021000059250
- McCurry SM, Logsdon RG, Teri L, Vitiello MV. Sleep disturbances in caregivers of persons with dementia: Contributing factors and treatment implications. *Sleep Medicine Reviews*. 2007; 11(2): 143–153. <http://dx.doi.org/10.1016/j.smrv.2006.09.002>. [PubMed: 17287134]
- National Alliance for Caregiving. Cancer caregiving in the U.S. An intense, episodic, and challenging care experience. 2016. Retrieved from http://www.caregiving.org/wp-content/uploads/2016/06/CancerCaregivingReport_FINAL_June-17-2016.pdf
- Nightingale CL, Sterba KR, Tooze JA, Milliron BJ, Tetrack LA, Paek MS, Weaver KE. Vulnerable characteristics and interest in wellness programs among head and neck cancer caregivers. *Supportive Care in Cancer*. 2016; 24(8):3437–3445. DOI: 10.1007/s00520-016-3160-z [PubMed: 26992407]
- Nijboer C, Triemstra M, Tempelaar R, Sanderman R, van den Bos GA. Determinants of caregiving experiences and mental health of partners of cancer patients. *Cancer*. 1999; 86(4):577–588. [PubMed: 10440685]

- Northouse L, Williams A-I, Given B, McCorkle R. Psychosocial Care for Family Caregivers of Patients With Cancer. *Journal of Clinical Oncology*. 2012; 30(11):1227–1234. DOI: 10.1200/jco.2011.39.5798 [PubMed: 22412124]
- Pearlin LI, Mullan JT, Semple SJ, Skaff M. Caregiving and the stress process: An overview of concepts and their measures. *The Gerontologist*. 1990; 30(5):583–594. [PubMed: 2276631]
- Penner JL. Psychosocial Care of Patients with Head and Neck Cancer. *Seminars in Oncology Nursing*. 2009; 25(3):231–241. <http://dx.doi.org/10.1016/j.soncn.2009.05.008>. [PubMed: 19635402]
- Pilkonis PA, Choi SW, Reise SP, Stover AM, Riley WT, Cella D, Group, P. C. Item Banks for Measuring Emotional Distress From the Patient-Reported Outcomes Measurement Information System (PROMIS®): Depression, Anxiety, and Anger. *Assessment*. 2011; 18(3):263–283. DOI: 10.1177/1073191111411667 [PubMed: 21697139]
- Pinquart M, Sörensen S. Correlates of Physical Health of Informal Caregivers: A Meta-Analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2007; 62(2):P126–P137.
- Psoter WJ, Aguilar ML, Levy A, Baek LS, Morse DE. A preliminary study on the relationships between global health/quality of life and specific head and neck cancer quality of life domains in Puerto Rico. *Journal of Prosthodontics*. 2012; 21(6):460–471. DOI: 10.1111/j.1532-849X.2012.00848.x [PubMed: 22469330]
- Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*. 1977; 1(3):385–401. DOI: 10.1177/014662167700100306
- Rhee YS, Yun YH, Park S, Shin DO, Lee KM, Yoo HJ, Kim NS. Depression in Family Caregivers of Cancer Patients: The Feeling of Burden As a Predictor of Depression. *Journal of Clinical Oncology*. 2008; 26(36):5890–5895. DOI: 10.1200/jco.2007.15.3957 [PubMed: 19029423]
- Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, Gansler T. Nutrition and physical activity guidelines for cancer survivors. CA: A Cancer Journal for Clinicians. 2012; 62(4):242–274. DOI: 10.3322/caac.21142
- Schnoll RA, Malstrom M, James C, Rothman RL, Miller SM, Ridge JA, Goldberg M. Correlates of tobacco use among smokers and recent quitters diagnosed with cancer. *Patient Education and Counseling*. 2002; 46(2):137–145. [PubMed: 11867244]
- Selim AJ, Rogers W, Fleishman JA, Qian SX, Fincke BG, Rothendler JA, Kazis LE. Updated U.S. population standard for the Veterans RAND 12-item Health Survey (VR-12). *Quality of Life Research*. 2009; 18(1):43–52. DOI: 10.1007/s11136-008-9418-2 [PubMed: 19051059]
- Sherman AC, Simonton S, Adams D, Vural E, Owens B, Hanna E. Assessing quality of life in patients with head and neck cancer: Cross-validation of the european organization for research and treatment of cancer (eortc) quality of life head and neck module (qlq-h&n35). *Archives of Otolaryngology–Head & Neck Surgery*. 2000; 126(4):459–467. DOI: 10.1001/archotol.126.4.459 [PubMed: 10772298]
- Sherwood PR, Given BA, Given CW, Schiffman RF, Murman DL, Lovely M, Remer S. Predictors of distress in caregivers of persons with a primary malignant brain tumor. *Research in Nursing and Health*. 2006; 29(2):105–120. DOI: 10.1002/nur.20116 [PubMed: 16532486]
- Sklenarova H, Krumpelmann A, Haun MW, Friederich HC, Huber J, Thomas M, Hartmann M. When do we need to care about the caregiver? Supportive care needs, anxiety, and depression among informal caregivers of patients with cancer and cancer survivors. *Cancer*. 2015; 121(9):1513–1519. DOI: 10.1002/cncr.29223 [PubMed: 25677095]
- Speck RM, Courneya KS, Mâsse LC, Duval S, Schmitz KH. An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Journal of Cancer Survivorship*. 2010; 4(2):87–100. DOI: 10.1007/s11764-009-0110-5 [PubMed: 20052559]
- Ströhle A. Physical activity, exercise, depression and anxiety disorders. *Journal of Neural Transmission*. 2008; 116(6):777–784. DOI: 10.1007/s00702-008-0092-x [PubMed: 18726137]
- Taylor SE, Lobel M. Social comparison activity under threat: downward evaluation and upward contacts. *Psychological Review*. 1989; 96(4):569–575. [PubMed: 2678204]

- Vitaliano PP, Katon W, Unützer J. Making the Case for Caregiver Research in Geriatric Psychiatry. *The American Journal of Geriatric Psychiatry*. 2005; 13(10):834–843. <http://dx.doi.org/10.1097/00019442-200510000-00002>. [PubMed: 16223961]
- Vitaliano PP, Zhang J, Scanlan JM. Is Caregiving Hazardous to One's Physical Health? A Meta-Analysis. *Psychological Bulletin*. 2003; 129(6):946–972. DOI: 10.1037/0033-2909.129.6.946 [PubMed: 14599289]
- Ward EC, van As-Brooks CJ. *Head and neck cancer: treatment, rehabilitation, and outcomes*: Plural Publishing. 2014
- Ware JEJ, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. *Medical Care*. 1996; 34(3):220–233. [PubMed: 8628042]
- Weitzner MA, McMillan SC, Jacobsen PB. Family Caregiver Quality of Life: Differences Between Curative and Palliative Cancer Treatment Settings. *Journal of Pain and Symptom Management*. 1999; 17(6):418–428. [http://dx.doi.org/10.1016/S0885-3924\(99\)00014-7](http://dx.doi.org/10.1016/S0885-3924(99)00014-7). [PubMed: 10388247]
- Wu YS, Lin PY, Chien CY, Fang FM, Chiu NM, Hung CF, Chong MY. Anxiety and depression in patients with head and neck cancer: 6-month follow-up study. *Neuropsychiatric Disease and Treatment*. 2016; 12:1029–1036. DOI: 10.2147/NDT.S103203 [PubMed: 27175080]
- Zarit SH, Anthony CR, Boutselis M. Interventions with care givers of dementia patients: comparison of two approaches. *Psychology and Aging*. 1987; 2(3):225–232. [PubMed: 3268213]

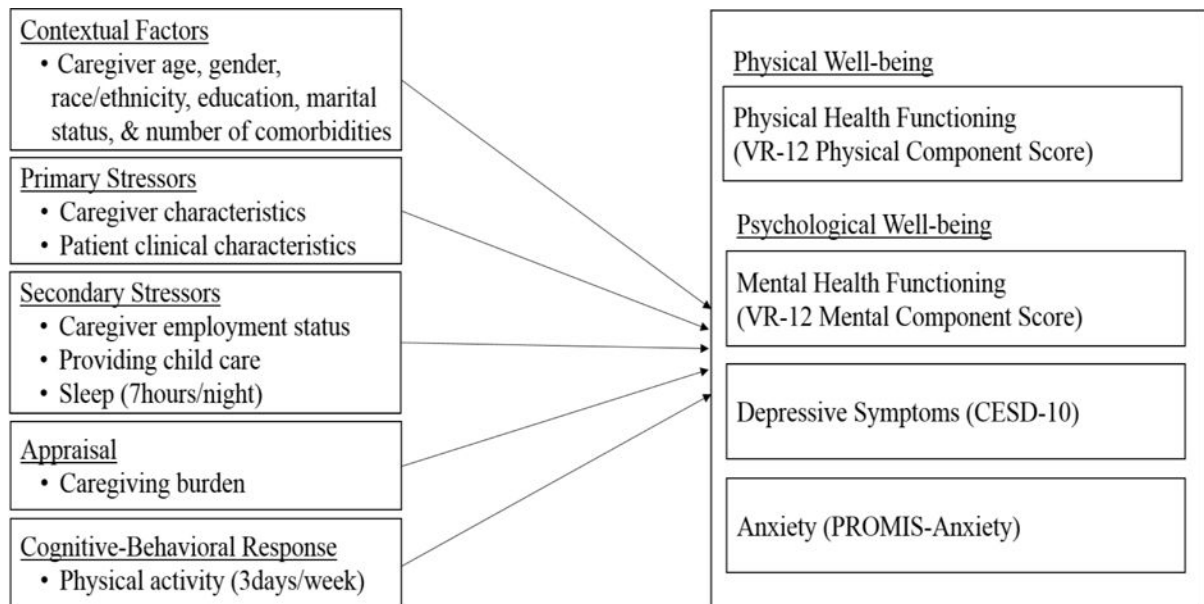


Figure 1.
Study Conceptual Model

Table 1

Characteristics of Head and Neck Cancer Caregivers and Patients (N=33)

Variables		N (%)	Mean (SD)
Caregiver characteristics			
Age			60.0 (11.2)
Gender	Female	27 (81.8)	
	Male	6 (18.2)	
Race/ethnicity	Non-Hispanic White	28 (84.9)	
	Other	5 (15.1)	
Education	< College	22 (66.7)	
	College graduate	11 (33.3)	
Marital status	Married/partnered	29 (87.9)	
	Other	4 (12.1)	
Full-time work status	Yes	6 (18.2)	
	No	27 (81.8)	
Relationship to patient	Spouse/partner	24 (72.7)	
	Other	9 (27.3)	
7 hours of sleep/night	Yes	19 (57.6)	
	No	14 (42.4)	
3 days physical activity/week	Yes	22 (66.7)	
	No	11 (33.3)	
2 comorbidities	Yes	15 (45.5)	
	No	18 (54.6)	
Living with the patient	Yes	29 (87.9)	
	No	4 (12.2)	
Days per week of care provided	1-3 days/week	6 (18.2)	
	4 days/week	27 (81.8)	
Hours of daily care provided	< 5 hours/day	24 (75.0)	
	5 hours/day	8 (25.0)	
Providing child care	Yes	5 (15.2)	
	No	28 (84.9)	
Caregiving burden			5.4 (3.9)
Patient characteristics			
Age			60.1 (10.7)
Gender	Female	5 (15.2)	
	Male	28 (84.9)	
AJCC Cancer stage	I-III	16 (48.5)	
	IV	17 (51.5)	
Month since diagnosis			28.8 (34.6)
2 comorbidities	Yes	16 (48.5)	
	No	17 (51.5)	

Table 2

Least-squares means and beta coefficients for physical and psychological well-being among head and neck cancer caregivers (N=33) by selected demographic, caregiving, and clinical variables

Variables	PCS ^a	MCS ^a	Depressive symptoms (CESD-10) ^b	PROMIS Anxiety ^b
Contextual Factors				
Age ^c	.45 * (.20)	.12 (.19)	-.30 * (.11)	-.30 [‡] (.15)
Gender	44.7 (2.61)	45.7 (2.25)	10.7 (1.45)	55.3 (1.92)
Female	51.0 (5.53)	51.7 (4.76)	5.2 (3.08)	48.4 (4.07)
Male				
Race/ethnicity	47.5 [‡] (2.48)	46.6 (2.25)	9.5 (1.48)	53.6 (1.94)
Non-Hispanic White	36.1 [‡] (5.86)	48.1 (5.32)	10.6 (3.51)	56.8 (4.60)
Other				
Education	42.8 [‡] (2.78)	46.1 (2.53)	10.9 (1.63)	56.1 (2.11)
< College	51.9 [‡] (3.93)	48.3 (3.58)	7.3 (2.31)	50.0 (2.99)
College graduate				
Marital status	45.8 (2.56)	47.9 (2.13)	8.9 (1.40)	53.1 (1.86)
Married/partnered	45.6 (6.89)	38.7 (5.75)	15.3 (3.78)	61.0 (5.00)
Other				
2 comorbidities	39.1 *** (3.16)	47.2 (3.07)	11.5 (1.98)	56.2 (2.62)
Yes	51.4 *** (2.88)	46.5 (2.81)	8.2 (1.81)	52.3 (2.39)
No				
Primary Stressors				
Days per week of care provided	47.2 (5.62)	48.2 (4.85)	7.2 (3.17)	51.7 (4.20)
1–3 days/week	45.5 (2.65)	46.5 (2.29)	10.3 (1.49)	54.6 (1.98)
4 days/week				
Hours of daily care provided	47.7 (2.67)	47.6 (2.45)	9.0 (1.61)	54.0 (2.12)
< 5 hours/day	43.2 (4.62)	44.9 (4.25)	11.8 (2.79)	53.3 (3.68)
5 hours/day				
Living with the patient	46.0 (2.56)	47.3 (2.20)	9.7 (1.46)	53.8 (1.92)
Yes	44.2 (6.88)	43.1 (5.91)	9.8 (3.93)	55.9 (5.17)
No				
Patient's Cancer stage	49.8 [‡] (3.29)	48.4 (2.95)	7.8 (1.91)	50.8 [‡] (2.46)
I-III	42.0 [‡] (3.20)	45.3 (2.86)	11.5 (1.85)	57.1 [‡] (2.38)
IV				
Patient's symptoms/dysfunction ^c	-.06 (.09)	-.08 (.08)	.10 * (.05)	.10 (.06)
Pain	.15 * (.07)	-.05 (.06)	-.01 (.04)	-.02 (.06)
Swallowing	.00 (.09)	-.10 (.07)	.04 (.05)	.11 (.07)
Senses	.15 * (.07)	-.10 (.06)	.02 (.04)	-.02 (.06)
Speech	.07 (.06)	-.03 (.06)	-.01 (.04)	-.01 (.05)
Social eating	.08 (.08)	-.15 * (.07)	.06 (.05)	.04 (.06)
Social contact				
Patient's month since diagnosis ^c	.03 (.07)	-.01 (.06)	-.00 (.04)	.00 (.05)
Patient's 2 comorbidities	44.3 (3.42)	43.7 (2.87)	11.7 (1.90)	56.8 (2.50)
Yes	47.2 (3.32)	49.8 (2.78)	7.8 (1.84)	51.5 (2.42)
No				
Patient's fatalism	-.78 (3.70)	-4.01 (3.12)	3.32 (2.03)	2.55 (2.75)
Secondary Stressors				
Full-time employment status	43.6 (5.61)	49.3 (4.84)	8.0 (3.19)	52.8 (4.22)
Yes	46.3 (2.64)	46.3 (2.28)	10.1 (1.50)	54.4 (1.99)
No				
Providing child care	51.2 (6.07)	50.4 (5.28)	8.6 (3.51)	51.3 (4.60)
Yes	44.9 (2.57)	46.2 (2.23)	9.9 (1.48)	54.6 (1.94)
No				
7 hours of sleep/night	50.3 * (2.91)	49.9 [‡] (2.59)	6.1 *** (1.51)	49.7 ** (2.05)
Yes	39.8 * (3.39)	42.6 [‡] (3.02)	14.6 *** (1.75)	60.0 ** (2.38)

Variables	PCS ^a	MCS ^a	Depressive symptoms (CESD-10) ^b	PROMIS Anxiety ^b
No				
Appraisal				
Caregiving burden ^c	-.24 (.62)	-1.72 *** (.44)	1.15 *** (.29)	1.30 ** (.41)
Cognitive-Behavioral Response				
3 days physical activity/week	49.6 * (2.69)	49.2 (2.43)	7.3 ** (1.50)	50.4 ** (1.90)
Yes	38.2 * (3.80)	42.1 (3.44)	14.5 ** (2.11)	61.3 ** (2.68)
No				

Note. All variables were examined in independent models. Numbers in parentheses indicate standard errors.

^aHigher score indicates better physical or mental health.

^bHigher score indicates more depressive symptoms or greater anxiety level.

^c β .

 $p < .001$,

**
 $p < .01$,

*
 $p < .05$

[#]
 $p < .10$

PCS = VR-12 Physical Component Score; MCS = VR-12 Mental Component Score