Published in final edited form as:

Support Care Cancer. 2011 October ; 19(10): 1511–1518. doi:10.1007/s00520-010-0975-x.

The relationship between weight loss and health-related quality of life in persons treated for head and neck cancer

Barbara A. Head,

University of Louisville School of Medicine, MDR Bldg., Suite 110, 511 South Floyd St., Ste. 110, Louisville, KY 40202, USA

Luke Heitz,

University of Louisville School of Medicine, MDR Bldg., Suite 110, 511 South Floyd St., Ste. 110, Louisville, KY 40202, USA

Cynthia Keeney,

University of Louisville School of Medicine, MDR Bldg., Suite 110, 511 South Floyd St., Ste. 110, Louisville, KY 40202, USA

John Myers,

Department of Bioinformatics and Biostatistics, University of Louisville, 485 E. Gray St., Louisville, KY 40202, USA

Savitri N. Appana,

Department of Bioinformatics and Biostatistics, University of Louisville, 485 E. Gray St., Louisville, KY 40202, USA

Jamie L. Studts,

Department of Behavioral Science, University of Kentucky College of Medicine, 127 College of Medicine Office Bldg., Lexington, KY 40536-0086, USA

Jeffrey Bumpous, and

University of Louisville School of Medicine, MDR Bldg., Suite 110, 511 South Floyd St., Ste. 110, Louisville, KY 40202, USA. Louisville Veterans Affairs Medical Center, 800 Zorn Ave., Louisville, KY 40206-1433, USA

Mark Pfeifer

University of Louisville School of Medicine, MDR Bldg., Suite 110, 511 South Floyd St., Ste. 110, Louisville, KY 40202, USA

Barbara A. Head: barbara.head@louisville.edu

Abstract

Purpose—This study explores the relationship between weight loss, health-related quality of life (HRQOL), and symptom burden in patients treated for head and neck cancers.

© Springer-Verlag 2010

Correspondence to: Barbara A. Head, barbara.head@louisville.edu.

Conflicts of interest None

Disclaimer Contents of this article do not represent the views of the Department of Veteran Affairs or the Federal Government.

Methods—Participants completed the Functional Assessment of Cancer Therapy—Head and Neck (FACT-H&N) and the Memorial Symptom Assessment Scale (MSAS) pre-treatment, mid-treatment, and post-treatment. Weights were recorded prior to treatment and at the post-treatment follow-up visit, and percentage weight loss was tabulated. Relationships between weight loss, HRQOL, and symptom burden were evaluated using the nonparametric Spearman rho. A simple linear regression model was developed to examine the influence weight loss has on HRQOL in a predictive manner.

Results—Average weight loss per patient was 12 lb with a modal value of 19. Weight loss was found to be significantly correlated with decreases in physical well-being, functional well-being, the Head and Neck specific subscale, and composite QOL scores. No significant correlations were found between weight loss and symptom burden as measured by the MSAS. Linear regression suggested that a 10% decrease in baseline weight resulted in a 19% decrease in the FACT-H&N score.

Conclusion—The strong association between weight loss and HRQOL supports the importance of efforts to prevent weight loss via patient education, aggressive monitoring, and immediate intervention to stop or reverse weight loss during treatment. New approaches to the weight loss and wasting experienced by patients should be developed and tested.

Keywords

Weight loss; Quality of life; Head and neck cancer; Symptom burden; Nutrition

Background

Weight loss is a common occurrence among patients diagnosed with and undergoing treatment for head and neck cancers. Even with nutritional counseling and support, it is estimated that 35–50% of this patient population are affected by weight loss [1]. Causes for such weight reduction can be anatomic, metabolic, or psychological in etiology [2]. Anatomicallly, the location of the cancer and focused treatment can result in mucositis, xerostoma, dysphagia, hoarseness, nausea and vomiting, and dysgeusia [2–7]. Often teeth must be removed and the patient's enjoyment of food is severely diminished [7]. Aspiration can result from impaired swallowing efficacy and further contribute to patient's weight loss [8]. Psychological symptoms including depression, anxiety, and distress can further compromise nutritional intake leading to lost pounds [9, 10].

Weight loss has been found to be an independent determinant of health-related quality of life (HRQOL) among patients receiving cancer care [11–14]. Similarly, a significant association with weight loss has been observed for each of the main dimensions of HRQOL (physical, functional, cognitive, and social) [13]. Cancer-related malnutrition may also negatively affect a patient's response to treatment, survival, costs of care, and sense of well-being while increasing the risk of infections and treatment toxicity [2, 12, 14].

Several studies of head and neck cancer patients have concluded that those with unintended weight loss greater than 10% have significantly lower quality of life scores at diagnosis and after treatment [2, 15]. Additionally, a study of head and neck cancer survivors found dental

and oral quality of life issues persist after treatment and have a clear negative impact across many domains of quality of life [7].

As part of a randomized trial of a novel telehealth symptom management intervention for individuals receiving treatment for head and neck cancer, weight loss (before and after treatment), HRQOL, and symptom distress were measured. In this study, investigators examined the relationship between weight loss, HRQOL, and symptom burden in a sample of 71 patients having completed treatment for head and neck cancer. The following questions guided our investigation:

1. Is there a relationship between weight loss and HRQOL after completion of treatment for head and neck cancer?
2. Is there a relationship between weight loss and symptom burden after completion of treatment for head and neck cancer?
3. If these relationships exist, how might this inform cancer care for head and neck cancer patients?

Methods

Study design

This study is a secondary analysis of prospective data collected for a randomized, parallel two group clinical trial testing the impact of a telehealth intervention for patients being treated for head and neck cancer [16]. Data related to weight loss, HRQOL, and symptom distress for both treatment and control participants were analyzed.

Weight loss information for each participant was extracted from the medical record. Patients were weighed prior to receiving any treatment for their cancer and again at their first post-treatment follow-up visit (approximately 4 weeks post-treatment completion). Percentage of weight loss per participant was then calculated. Data on HRQOL and symptom distress were collected 3 to 4 weeks post-treatment completion as specified by the clinical trial protocol.

Site

Participants for this clinical trial were recruited from patients receiving care from the Multidisciplinary Head and Neck Cancer Team at the James Graham Brown Cancer Center and the Louisville Veteran's Administration Medical Center over a 2-year period from June 2006 through June 2008.

Sample

Patients eligible for study participation met the following inclusion criteria: (1) initial diagnosis of head or neck cancer including cancers of the oral cavity, salivary glands, paranasal sinuses and nasal cavity, pharynx, and larynx; (2) involvement in a treatment plan including one or more modalities (i.e., surgery, chemotherapy, radiation, or any combination); (3) capability to give independent informed consent; and (4) ability to speak, read, and comprehend English at an eighth grade level or above. Patients were excluded from participation if they had a known active substance abuse problem, a thought disorder or

otherwise compromised cognitive functioning. Patients meeting criteria were approached during their first visit to the head and neck cancer clinic, and the study was explained to them. Those stating they were interested in participation were either consented and enrolled at that time or during a subsequent visit either at the cancer clinic or during a home visit by research staff. The study was approved by the University of Louisville's Human Subject Protection Program and the Research and Development Committee of the Louisville Veterans Affairs Medical Center prior to any study activity. Data used for this evaluation was provided by 71 participants who completed all study measures.

Demographic descriptors are summarized in Tables 1 and 2. The sample population had a mean age of 60 (SD= 11 years), was predominately white (89%) and male (87%), and received treatment in an urban setting (79%). A majority of participants received radiation (99%) and chemotherapy (72%), while some had surgery (37%). With regard to staging, 11 participants (16%) had stage I disease, 25 (35%) had stage II disease, 19 (27%) had stage III disease, six (9%) had stage IV disease, one (1%) had an in situ tumor, while nine participants' (13%) disease stage was unknown. Therefore, approximately 50% of the participants had either stage I or II disease.

Measures

For the purpose of this secondary data analysis of data collected prospectively during a clinical trial, results on two measures used to evaluate outcomes were analyzed, the Functional Assessment of Cancer Therapy—Head and Neck Scale (FACT-H&N) and the Memorial Symptom Assessment Scale (MSAS). Completion of these surveys required approximately 30 min. Participants were told of the study requirements prior to informed consent.

Functional Assessment of Cancer Therapy—Head and Neck Scale—The FACT-G (general) is a multidimensional HRQOL instrument designed for use with all cancer patients. The instrument has 28 items divided into four well-being subscales: functional, physical, social, and emotional. This generic core questionnaire was found to meet or exceed requirements for use in oncology based upon ease of administration, brevity, reliability, validity, and responsiveness to clinical change [17]. Added to the core FACT-G questionnaire is the Head and Neck specific subscale consisting of 11 items specific to this cancer site. The total FACT-H&N is the composite of the four subscales of the FACT-G and the Head and Neck specific subscale. The Trial Outcome Index (TOI) is the sum of the physical well-being, functional well-being, and cancer-specific subscales. List et al. [18] found the FACT-H&N to be reliable and sensitive to differences in functioning for patients with head and neck cancers. Cronbach's alpha for total FACT-G was 0.89 and for the Head and Neck subscale was 0.63.

The FACT-H&N was chosen for this study because it (1) is not specifically related to a treatment modality or subsite among head and neck cancers, (2) allows comparison across cancer diagnoses while still probing issues specific to head and neck cancer, (3) is short and can be completed quickly, (4) includes the psychosocial domains of social/family and emotion subscales as well as physical and functional areas, and (5) is self-administered. The

FACIT instruments have proven reliable across modes of administration [19]; therefore, participants needing assistance could be interviewed using the scales.

Memorial Symptom Assessment Scale—This multidimensional scale measures the prevalence, severity, and distress associated with the most common symptoms experienced by cancer patients. Physical and emotional subscale scores as well as a Global Distress Index can be generated from patient responses. The MSAS has demonstrated reliability and validity in both in- and outpatient cancer populations [20–22]. Initial psychometric evaluation by Portenoy et al. [23] used factor analysis to define two subscales: psychological symptoms and physical symptoms. Estimates of internal consistency reliability using Cronbach's α coefficients suggested appropriate reliability 0.88 and 0.83, respectively. Additional correlational analysis also supported the convergent validity of the instrument. It was chosen for this study because of its proven ability to measure both the presence and intensity of experienced symptoms [6, 20, 24, 25].

Procedure

Patients completed these measures at baseline (pre-treatment), at the midpoint of their treatment (at least 3 weeks into treatment up until 2 weeks post-treatment), and post-treatment (at least 3 weeks after completion of treatment). Most were able to complete study instruments independently after the first completion making the use of mailed surveys possible. However, patients who requested assistance or had difficulty with protocol compliance were visited at home or received telephone assistance. Offering and providing assistance with surveys encouraged participants with lower educational and literacy abilities to complete surveys accurately. Additionally, basic demographic information was collected at baseline. All data were entered into a Statistical Package for the Social Sciences 16 data file which was used to perform statistical analysis.

In the cancer clinic where this study occurred, all patients (including the participants in this study) received dietary counseling within the first week of beginning treatment including instruction about the importance of increasing calories and protein and maintaining good nutrition during and following treatment. Patients were weighed daily during radiation therapy and were referred to the dietician at the first sign of weight loss. Nutritional supplementation, including placement of a gastrointestinal feeding tube, was strongly recommended although some patients refused such intervention.

Statistical analysis

Data from all individuals who completed the study were evaluated. For the entire sample ($N=71$), the mean age, ethnicity, gender, setting in which treatment was received, tumor stage, site of cancer, percent weight loss, average weight loss, and whether the individual had surgery, chemotherapy, or radiation were collected or calculated from available data. For each of the instruments and the subscales, a scatter plot of weight loss and mean HRQOL score was constructed. In addition, for each instrument and subscale, the nonparametric Spearman rho correlation coefficient was calculated testing whether there is a significant relationship between weight loss and HRQOL. A simple linear regression model was developed in which HRQOL (measured on FACT-H&N) was made a function of

percent weight loss to examine the influence weight loss has on HRQOL in a predictive manner. In a second regression model, other variables (age, tumor stage, treatment modalities, body mass index) were included to determine if such factors significantly impacted HRQOL.

Results

The range of weight loss was 89 lb (maximum gain=+11, maximum loss=-78). The average weight loss for the sample population was 13 lb (SD=13.6 lb) with a modal value of 19. One patient, unfortunately, had a 78-lb weight loss. It was indicated that this individual was an outlier (Cooks $D > 0.9$ and leverage statistic=0.45); thus, the data from this individual were eliminated from subsequent analyses (since that data would have excessive leverage on the overall results). See Fig. 1 for a histogram displaying percentage weight loss for the remaining 71 participants.

Table 3 compares the FACT-H&N scale and subscale scores for this sample with normative data. Our study sample had comparable scores to the normative sample of 151 patients from two study sites used to test the reliability and validity of the FACT-H&N [18].

As seen in Fig. 2, for most instruments and subscales, a positive correlation between weight loss and HRQOL scores was observed. That is, as an individual's weight decreased (the individual experienced a greater weight loss), HRQOL scores decreased for that individual. Table 4 provides the correlation coefficients for the associations between weight loss and HRQOL scores for each instrument and subscale, suggesting that weight loss is associated with significant decreases in (1) physical well-being ($r = 0.28, p = 0.02$), (2) functional well-being ($r = 0.28, p = 0.02$), (3) FACT-G scores ($r = 0.27, p = 0.03$), (4) head and neck cancer-specific scores ($r = 0.32, p = 0.01$), (5) FACT-H&N scores ($r = 0.33, p = 0.008$), and (6) TOI scores ($r = 0.32, p = 0.008$). These correlations are graphically presented in Fig. 2. Correlation coefficients for the associations between weight loss and symptom burden scores on the MSAS revealed no significant correlations.

The simple linear regression model (Fig. 3) suggests that a 10% decrease in baseline weight (the individual experiences greater weight loss) will result in a 19% decrease in the FACT-H&N HRQOL score ($\beta = 1.92, p < 0.001$). When other variables (age, stage of disease, treatment modality, and body mass index) are added to the model along with percent of weight loss, a stepwise regression analysis found only percent weight loss to be a significant predictor of HRQOL.

Discussion

As with other studies of weight loss in cancer [11–13] and specifically weight loss in head and neck cancer [2, 8, 15], these data revealed significant associations between weight loss and self-rated HRQOL. These correlations were most significant for those subscales focused on physical/functional well-being and head and neck specific concerns. While social and emotional well-beings were less highly correlated, when included in the FACT-G and FACT-H&N scores, the overall scores are significantly correlated with weight loss.

Understandably, social and emotional well-beings are less affected than physical/functional aspects by a serious physical alteration such as weight loss.

An important finding in our analysis is the notable significance of a 10% weight loss on HRQOL scores (approximately 19% of the FACT-H&N total score). Ringesh and colleagues studied differences in FACT-H&N scores and determined that a 12-point negative change in score constitutes a minimally important difference (MID). The mean FACT-H&N score in our study was 95 with median and modal scores of 101. Therefore, a 10% decrease in baseline weight would result in a FACT-H&N score change of approximately 19 points based on the linear regression model (Fig. 3), exceeding the MID by seven points.

Differing from other studies [26], we found no significant correlations between weight loss and symptom burden. This may support the finding of Ravasco and colleagues that cancer stage mainly influenced the severity of symptoms while weight loss was more detrimental to HRQOL function scales [11]. However, we did not find a significant correlation between cancer stage and the results of the MSAS in this study.

Our study is limited by the relatively small sample size and the limited descriptive variables under consideration. Future studies employing larger sample sizes should consider the actual nutritional interventions attempted during treatment (such as NG or PEG tube placement for administration of nutrition) and their impact on weight loss and HRQOL. Information on amount of weight lost before diagnosis and treatment initiation was not collected on our sample and may well be a confounding factor.

Our sample appears to favor the less severe disease end of the head and neck cancer spectrum. This may be because those with more advanced disease opt for no treatment, and a requirement for study participation was active treatment. However, this is a study limitation potentially affecting generalizability of our findings.

An additional limitation is the fact that our sample was predominantly male (87%). The American Cancer Society estimates that 36,540 new cases of oral cavity and pharynx cancers will be diagnosed in 2010 and 70% of those will be in male patients [27]. It is probably that our higher concentration of male participants was due to the fact that a Veterans Administration Hospital was one of our recruitment sites.

Implications for practice

The strong association between weight loss and quality of life supports the importance of efforts to prevent weight loss via patient education, aggressive monitoring, and immediate intervention to stop or reverse weight loss once identified. Several studies have shown that nutritional interventions during cancer care improve quality of life [28, 29], and professional preventive support has been strongly recommended for head and neck patients receiving radiation therapy [15]. Isenring et al. found that patients receiving individualized nutritional interventions had significantly smaller deteriorations in weight and HRQOL when compared to those receiving usual care during radiation therapy for head and neck cancer [28]. However, Halfdanarson and colleagues reported a systematic review and meta-analysis of

randomized trials and concluded that dietary counseling did not significantly improve HRQOL in patients with cancer, yet the observed trend toward benefit likely justifies further study [30]. Notably, this meta-analysis suffered from the lack of well-conducted clinical trials meeting study criteria. Others working in the field of cancer nutrition and rehabilitation have suggested that earlier intervention (prevention) in cancer-associated weight loss is justified, and patients should have comprehensive care from the onset of the illness [31].

Providing supportive interventions such as tube feedings and dietary counseling does not guarantee weight stability as many of these participants still lost weight during the treatment period with an average weight loss of 12.4 and median weight loss of 10 lb during treatment (see Table 1). Similarly, a study by Oates et al. found that patients treated for nasopharyngeal carcinoma receiving nutritional support with gastrostomy feeding tubes had a median weight loss of 15.4 lb [32]. Realizing the difficulty of preventing weight loss using current approaches, experts have pointed to the need for new approaches to the weight loss and wasting experienced by patients and rigorous scientific testing of such approaches [31]. Perhaps involving every member of the interdisciplinary team as well as patient caregivers in evaluating and targeting weight loss and impacting factors would be more beneficial than simply initiating supplementation.

A recent study merged 30 randomized controlled trials and found HRQOL scores (as measured by the European Organisation for Research and Treatment of Cancer quality of life core questionnaire) predicted survival [33]. In this meta-analysis, loss of appetite proved to be one of the most predictive of the HRQOL parameters. Similarly, three large studies of head and neck cancer have now demonstrated that HRQOL is associated with survival [34–36] pointing to the need to both access and address HRQOL and the often corresponding weight loss in these patients.

Weight loss during treatment for head and neck cancer should alert the clinician to the possibility of deteriorating HRQOL and a poorer prognosis. Weight loss may well be an easily identified trigger for further assessment and targeted interventions by the interdisciplinary team to prevent or reverse potential deterioration in a patient's well-being.

Acknowledgments

This research was funded in part by a grant from the National Cancer Institute, National Institutes of Health.

This material is the result of work supported with resources and the use of facilities at the Louisville Veterans Affairs Medical Center.

References

1. Van Bokhorst-de van der Schueren M, van Leeuwen P, Kuik D. The impact of nutritional status on the prognoses of patients with advanced head and neck cancer. *Cancer*. 1999; 86:519–527. [PubMed: 10430262]
2. Petruson KM, Silander EM, Hammerlid EB. Quality of life as predictor of weight loss in patients with head and neck cancer. *Head Neck*. 2005; 27:302–310. [PubMed: 15712299]
3. Taylor JC, Terrell JE, Ronis DL, et al. Disability in patients with head and neck cancer. *Arch Otolaryngol Head Neck Surg*. 2004; 130:764–769. [PubMed: 15210560]

4. Bansal M, Mohanti BK, Shah N, Chaudhry R, Bahadur S, Shukla NK. Radiation related morbidities and their impact on quality of life in head and neck cancer patients receiving radical radiotherapy. *Qual Life Res.* 2004; 13:481–488. [PubMed: 15085920]
5. Connor NP, Cohen SB, Kammer RE, et al. Impact of conventional radiotherapy on health-related quality of life and critical functions of the head and neck. *Int J Radiat Oncol Biol Phys.* 2006; 65:1051–1062. [PubMed: 16682129]
6. Chang VT, Hwang SS, Feuerman M, Kasimis BS. Symptom and quality of life survey of medical oncology patients at a veterans affairs medical center: a role for symptom assessment. *Cancer.* 2000; 88:1175–1183. [PubMed: 10699909]
7. Duke RL, Campbell BH, Indresano AT, et al. Dental status and quality of life in long-term head and neck cancer survivors. *Laryngoscope.* 2005; 115:678–683. [PubMed: 15805880]
8. Campbell BH, Spinelli K, Marbella AM, Myers KB, Kuhn JC, Layde PM. Aspiration, weight loss, and quality of life in head and neck cancer survivors. *Arch Otolaryngol Head Neck Surg.* 2004; 130:1100–1103. [PubMed: 15381598]
9. Pandey M, Devi N, Thomas BC, Kumar SV, Krishnan R. Distress overlaps with anxiety and depression in patients with head and neck cancer. *PsychoOncology.* 2007; 16:582–586. [PubMed: 17109494]
10. Aarstad H, Aastad A, Heimdal J-H, Olofsson J. Mood, anxiety and sense of humor in head and neck cancer patients in relation to disease stage, prognosis and quality of life. *Laryngologica.* 2005; 125:557–565.
11. Ravasco P, Monteiro-Grillo, Vidal PM, Camilo ME. Cancer: disease and nutrition are key determinants of patients' quality of life. *Support Care Cancer.* 2004; 12:246–252. [PubMed: 14997369]
12. Huhmann MB, Cunningham RS. Importance of nutritional screening in treatment of cancer-related weight loss. *Lancet Oncol.* 2005; 6:334–343. [PubMed: 15863382]
13. Nourissat A, Vasson MP, Merrouche Y, et al. Relationship between nutritional status and quality of life in patients with cancer. *Eur J Cancer.* 2008; 44:1238–1242. [PubMed: 18467087]
14. Nitenberg G, Raynard B. Nutritional support of the cancer patient: issues and dilemmas. *Crit Rev Oncol-Hematol.* 2000; 34:137–168. [PubMed: 10838261]
15. van den Berg MG, Rasmussen-Conrad EL, Gwasara GM, Krabbe PF, Naber AH, Merks MA. A prospective study on weight loss and energy intake in patients with head and neck cancer, during diagnosis, treatment and revalidation. *Clin Nutr.* 2006; 25:765–772. [PubMed: 16698130]
16. Head B, Studts J, Bumpous J, et al. Development of a telehealth intervention for head and neck cancer patients. *Telemed E Health.* 2009; 15:100–108.
17. Cella DF, Tulsky DS, Gray G, et al. The Functional Assessment of Cancer Therapy (FACT) scale: development and validation of the general measure. *J Clin Oncol.* 1993; 11:570–579. [PubMed: 8445433]
18. List MA, D'Antonio LL, Cella DF, et al. The performance status scale for head and neck cancer patients and the functional assessment of cancer therapy-head and neck scale. A study of utility and validity. *Cancer.* 1996; 77:2294–2301. [PubMed: 8635098]
19. FACIT Measurement System. The Functional Assessment of Chronic Illness Therapy (FACIT) Measurement System. FACIT; Chicago: 2005.
20. Chang V, Hwang S, Feuerman M, Kasimis B, Thaler H. The memorial symptom assessment scale short form. *Cancer.* 2000; 89:1162–1171. [PubMed: 10964347]
21. Tranmer JE, Heyland D, Dudgeon D, Groll D, Squires-Graham M, Coulson K. Measuring the symptom experience of seriously ill cancer and noncancer hospitalized patients near the end of life with the memorial symptom assessment scale. *J Pain Symptom Manage.* 2003; 25:420–429. [PubMed: 12727039]
22. Portenoy RK, Thaler HT, Kornblith AB, et al. The memorial symptom assessment scale: an instrument for the evaluation of symptom prevalence, characteristics and distress. *Eur J Cancer.* 1994; 30A:1326–1336. [PubMed: 7999421]
23. Portenoy R, Thaler H, Kornblith A. The memorial symptom assessment scale: an instrument for the evaluation of symptom prevalence, characteristics and distress. *Eur J Cancer Care (Engl).* 1994; 30A:1326–1336.

24. Nelson JF, Meier DE, Litke A, Natale DA, Siegel RE, Morrison RS. The symptom burden of chronic critical illness. *Crit Care Med*. 2004; 32:1527–1534. [PubMed: 15241097]
25. Harrison LB, Zelefsky MJ, Pfister DG, et al. Detailed quality of life assessment in patients treated with primary radiotherapy for squamous cell cancer of the base of the tongue. *Head Neck*. 1997; 19:169–175. [PubMed: 9142514]
26. Capuano G, Grosso A, Gentile PC, et al. Influence of weight loss on outcomes in patients with head and neck cancer undergoing concomitant chemoradiotherapy. *Head Neck*. 2008; 30:503–508. [PubMed: 18098310]
27. American Cancer Society. Cancer facts and figures 2010. American Cancer Society; Atlanta: 2010.
28. Isenring EA, Capra S, Bauer JD. Nutrition intervention is beneficial in oncology outpatients receiving radiotherapy to the gastrointestinal or head and neck area. *Br J Cancer*. 2004; 91:447–452. [PubMed: 15226773]
29. Caro MMM, Laviano A, Pichard C. Impact of nutrition on quality of life during cancer. *Curr Opin Clin Nutr Metab Care*. 2007; 10:480–487. [PubMed: 17563467]
30. Halfdanarson TR, Thordardottir E, West CP, Jatoi A. Does dietary counseling improve quality of life in cancer patients? A systematic review and meta-analysis. *J Support Oncol*. 2008; 6:234–237. [PubMed: 18551861]
31. MacDonald N. Is there evidence for earlier intervention in cancer-associated weight loss? *Support Oncol*. 2003; 1:279–286.
32. Oates J, Clark JR, Read J, et al. Prospective evaluation of quality of life and nutrition before and after treatment for nasopharyngeal carcinoma. *Arch Otolaryngol Head Neck Surg*. 2007; 133:533–540. [PubMed: 17576902]
33. Quinten C, Coens C, Mauer M, et al. Baseline quality of life as a prognostic indicator of survival: a meta-analysis of individual patient data from EORTC clinical trials. *Lancet*. 2009; 10:865–871. [PubMed: 19695956]
34. Karvonen-Gutierrez CA, Ronis DL, Fowler KE, Terrell JE, Gruber SB, Duffy SA. Quality of life scores predict survival among patients with head and neck cancer. *J Clin Oncol*. 2008; 26:2754–2760. [PubMed: 18509185]
35. Goldstein DP, Hynds Karnell L, Christensen AJ, Funk GF. Health-related quality of life profiles based on survivorship status for head and neck cancer patients. *Head Neck*. 2007; 29:221–229. [PubMed: 17163462]
36. Grignon L, Jameson M, Karnell L. General health measures and long-term survival in patients with head and neck cancer. *Arch Otolaryngol Head Neck Surg*. 2007; 133:471–476.

Fig. 1.
Histogram of pounds lost during treatment

Fig. 2.
Correlation plots of percent weight loss and QOL/symptom burden scale/subscales

Fig. 3.
Fit plot for percent change in FACT-H&N score from baseline

Table 1
Patient demographics and medical information (N= 71)—continuous characteristics

Characteristic	Number	Mean	SD	Median	Minimum	Maximum
Age	71	60.2	11.2	60	36	85
Weight loss	71	-12.4	12.9	-10	-78	11
Percent weight loss	71	-6.5	5.3	-6	-23	4
BMI	70 ^a	27.1	7.8	27	13	66

^a Height not available on one patient

Table 2Patient demographics and medical information ($N=71$)—categorical characteristics

Characteristic	Level	N (%)
Gender	Male	62 (87.3)
	Female	9 (12.7)
Race	Caucasian	63 (88.7)
	African-American	8 (11.3)
Setting	Urban	56 (78.9)
	Rural	15 (21.1)
Treatment group	Treatment	41 (57.7)
	Control	30 (42.3)
Tumor stage	Stage I	11 (15.5)
	Stage II	25 (35.2)
	Stage III	19 (26.8)
	Stage IV	6 (8.5)
	In situ	1 (1.4)
	Not staged/stage unknown	9 (12.7)
Had surgery	No	45 (63.4)
	Yes	26 (36.6)
Received chemotherapy	No	20 (28.2)
	Yes	51 (71.8)
Received radiation	No	1 (1.4)
	Yes	70 (98.6)
Site of cancer	Oral cavity	12 (16.9)
	Pharynx	22 (31.0)
	Larynx	21 (29.6)
	Salivary glands	6 (8.5)
	Paranasal sinuses	2 (2.8)
	Angiosarcoma	1 (1.4)
	Unknown primary	7 (9.9)

Table 3

Study data compared to normative data

	Normative data			Study data		
	Mean	SD	α	Mean	SD	α
PWB	21.6	5.7	0.79	19.0	7.4	0.84
SWB	21.6	5.6	0.59	21.8	5.1	0.83
EWB	16.9	2.9	0.83	17.9	5.1	0.81
FWB	17.9	6.1	0.59	16.1	7.6	0.89
HNCS	19.2	7.2	0.63	20.2	8.8	0.80

PWB physical well-being, EWB emotional well-being, SWB social well-being, FWB functional well-being, HNCS H&N cancer subscale

Table 4

Spearman rho (r_s) coefficients for association between percent weight loss and QOL/symptom burden scales post-treatment

Scale/subscale [1]	r_s	p value	
QOL			
PWB	0.279	0.022	<i>_a</i>
SWB	0.177	0.162	ns
EWB	0.129	0.295	ns
FWB	0.275	0.024	<i>_a</i>
FACT-G	0.271	0.027	<i>_a</i>
HNCS	0.317	0.009	<i>_b</i>
FACT-H&N	0.326	0.008	<i>_b</i>
TOI	0.320	0.008	<i>_b</i>
Symptom burden			
GDI	-0.072	0.622	ns
PhysSub	-0.257	0.096	ns
PsychSub	-0.010	0.951	ns
Total MSAS	-0.130	0.295	ns

PWB physical well-being, *SWB* social WB, *EWB* emotional WB, *FWB* functional WB, *FACT-G* FACT-general, *HNCS* head and neck cancer specific, *FACT-H&N* total FACT-general plus HNCS score, *TOI* Trial Outcome Index, *GDI* Global Distress Index, *PhysSub* Physical Symptom subscale, *PsychSub* Psychological Symptom subscale, *Total MSAS* total score on Memorial Symptom Assessment Scale, *QOL* quality of life

^aSignificant at the 5% level

^bSignificant at the 1% level