ORIGINAL ARTICLE

HEALTH BEHAVIORS OF HEAD AND NECK CANCER PATIENTS THE FIRST YEAR AFTER DIAGNOSIS

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Abstract: *Background.* This prospective, cohort study is the first to describe 5 health behaviors of head and neck cancer patients the first year after diagnosis.

Methods. Patients ($N = 283$) were recruited in otolaryngology clinic waiting rooms and asked to complete written surveys. A medical record audit was also conducted. Descriptive statistics and multivariate analyses were conducted to determine which variables were associated with the 5 health behaviors.

Results. Half of the patients smoked and 25% were problem drinkers. Over half of the smokers and drinkers quit 1 year post-diagnosis. Smoking and problem drinking were highly associated and both were associated with lower body mass index (BMI) ($p < .01$). Moreover, physical activity and sleep were associated with each other ($p < .01$). Low SLEEP (Medical Outcomes Study Sleep Scale) scores were common and highly associated with depression ($p < .01$).

Conclusion. The health behaviors of head and neck cancer patients are interrelated, and assessing and treating these behaviors together may be beneficial. ©2007 Wiley Periodicals, Inc.* *Head Neck* **30:** 93–102, 2008

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Tobacco and alcohol use are well-known primary risk factors for developing head and neck cancer. Smoking and problem drinking have been associated with decreased quality of life scores[1,2] and decreased survival.[3,4] This may be due to the more advanced stage of disease in smokers and problem drinkers, the immunosuppressive effects of smoking and problem drinking, impaired absorption of nutrients, poor compliance with treatment, or increased rate of death due to other smoking and alcohol-related diseases.[3,5]

Diets high in fruits and vegetables and low in high-fat foods such as red meat are protective against most cancers of the head and neck,[6,7] can

affect the occurrence of second primary cancers,[8] and are associated with reduced cancer mortality.[3] There is also evidence that a sedentary lifestyle may promote certain types of cancer, such as colon or breast[9]; however, the association with physical activity and head and neck cancer is unknown. Treatment for head and neck cancer, which can include surgery, radiation, and chemotherapy, can impair nutritional intake and decrease physical activity.

Sleep disturbances are common in head and neck cancer patients. One study found that 91.7% of the head and neck cancer patients studied had obstructive sleep apnea compared with only 9.1% of the general adult population.[10] Receiving radiation in the head and neck can cause severe xerostomia, which can keep people awake at night in and of itself, or lead to nocturnal polyuria, which also disturbs the patient's sleep. Although there is no evidence of causality, associations have been drawn between sleep and mortality, with patients sleeping either 8 hours or more or 6 hours or less having a significantly higher risk of mortality than those who slept 7 hours per night.[11]

Smoking and alcohol use have been well studied in this population; however, nutritional status, exercise, and sleep and the relationship between health behaviors has not been well studied. Although many clinical and demographic variables cannot be altered to improve outcomes, health behaviors are potentially "changeable" conditions that may influence recurrence and survival. This study analyzes 5 health behaviors (smoking, problem drinking, nutrition, physical activity, and sleep) of head and neck cancer patients in the first year after diagnosis. The results of this study are expected to identify those patients with head and neck cancer at risk for poor health behaviors so that timely identification and effective intervention may improve risk assessment and outcomes.

MATERIALS AND METHODS

This was a prospective, cohort study of patients enrolled in the University of Michigan Head and Neck Cancer, Specialized Programs of Research Excellence (SPORE), Project 3 study entitled: Molecular Markers, Health Behaviors and Comorbidities as Predictors of Tumor Recurrence, Survival, and Quality of Life in Head and Neck Cancer. The dependent variables were baseline and 1-year health behaviors including smoking, problem drinking, body mass index (BMI), caloric intake, physical activity, and sleep. Multivariate analyses controlled for demographic, health characteristic, treatment, and the other health behavior variables.

Study Population/Setting/Place. Of 513 newly diagnosed patients with head and neck squamous cell cancer approached for participation in the SPORE study, 375 (73%) were eligible and agreed to participate. Included in the study were 283 patients who had baseline (pretreatment) data and were potentially available for 1-year follow-up (unless they died or were unable to be located). Excluded were those: (1) less than 18 years of age; (2) pregnant; (3) who are non-English speaking; (4) psychiatrically or mentally unstable (such as suicidal ideation, acute psychosis, or dementia); (5) found to have a non–upper aerodigestive tract cancer (such as thyroid or skin cancer); and (6) who had recurrent disease or previously treated head and neck squamous cell carcinoma. Human subjects' approval was received from 3 study sites: the University of Michigan Medical Center, Veterans Affairs (VA) Ann Arbor Healthcare System, and Henry Ford Health System.

Procedure. Research assistants recruited patients with head and neck cancer to the study in the waiting rooms of the otolaryngology clinics by obtaining signed, informed consent and providing a written survey that had questions on health behaviors and demographics. A medical record audit was also conducted. Measurement time points were every 3 months thereafter for most variables and yearly for selected variables.

Measures.

Health Behavior Measures. Those who smoked cigarettes in the prior month were considered current smokers. The previously validated 10-item instrument, Alcohol Use Disorders Identification Test (AUDIT),[12] was used to measure alcohol use; the score ranges from 0 to 40, with a score of 8 or more indicating problem drinking.[13] The validated Willett food frequency questionnaire was used to measure mean daily calories.[14,15] BMI (weight in kilograms divided by the square of height in meters) was also used to measure nutritional/physical activity status; the 1999 to 2002 population mean was 28 for adults from the United States.[16] The validated Physical Activity scale for the Elderly (PASE)[17] was used to measure activity; scores ranged from 0 to 400 or more, and the population mean for people age 65 to 100 was 103.

Given that many of our patients with head and neck cancer are elderly, and all of them are chronically ill, we felt the PASE was appropriate for use compared with other instruments as it focuses on activities of daily living versus rigorous exercise regimens. The PASE has been used previously in a study of end-stage renal disease patients with a mean age of 52; the mean score for that population was 90.3 ± 76.8.[18] Sleep was assessed using validated questions from the Medical Outcomes Study (MOS); scores ranged from 0 to 100, and the population mean was 72.[19]

Demographics and Clinical Measures. Standard questions on demographics were asked including age, sex, race, marital status, and educational level. Tumor sites were classified into 3 groups: (a) larynx, (b) oro-, hypo-, naso-pharynx or unknown primary, and (c) oral cavity or sinus. Tumor stages were measured using the American Joint Committee on Cancer (AJCC) staging classification system[20] and grouped into stage 0, I, and II versus stage III and IV. Data were collected on having received (yes/no) radiotherapy, chemotherapy, surgery (any type, excluding biopsies), having a feeding tube at 1-year, and having a tracheostomy at 1-year. Comorbidities were measured using the Adult Comorbidity Evaluation-27 (ACE-27) and grouped into none or mild comorbidities versus moderate or severe comorbidities.[21,22] Depressive symptoms were measured using the validated Geriatric Depression Scale-Short Form (GDS-SF). A score of 4 or more indicates probable depression.[23]

Data Analysis Plan. Descriptive statistics (means and frequencies) were conducted on all variables. Bivariate analyses were also conducted to determine differences between those who were lost to follow-up or died compared with those who survived and were not lost to follow-up. Separate logistic and linear regression tests were conducted to determine the association between each of the independent variables (health behaviors, demographics, health characteristics, and treatments) and baseline and 1-year dependent variables of smoking, alcohol problem, mean daily caloric intake, BMI, physical activity, and sleep. As some of the health behaviors are interrelated, the multivariate regressions for each individual health behavior also controlled for other health behavior variables. Because of the limited number of smokers and drinkers at 1 year, fewer predictors were used in the smoking and problem drinking logistic regression analyses; those predictors with the most clinical relevance were selected for testing in the logistic regression models.[24] Power was sufficient to include all of the independent variables in the linear regression models where the dependent variables were mean daily calorie intake, BMI, physical activity, and sleep. Since hospital site was highly collinear with sex and race (with more males at the VA and more nonwhites at the VA and Henry Ford Hospital), hospital site was not included in the multivariate analyses. Since radiation and chemotherapy were highly collinear, and more patients had radiation than chemotherapy, radiation was placed in the model and chemotherapy was omitted. The data were analyzed using SAS software (SAS Institute, Cary, NC). Values for $p < .05$ are reported.

RESULTS

Description of the Baseline Sample. The sample is described in Tables 1 and 2. The mean age of the 283 respondents was 59, and most were male. The majority were non-Hispanic white, while 15% were nonwhite or Hispanic (8% black, 7% of other race/ethnicity, mostly Native American and Hispanic). Over half were married, and over half had a high school diploma or less. Most were from the University of Michigan Medical Center.

Twenty-seven percent had cancer of the larynx, 52% had cancer of the (oro-, hypo-, or naso-) pharynx or unknown primary, while 21% had cancer of the oral cavity/sinus. Most had stage III or IV cancer. About one third had moderate to severe comorbidities, and half screened positive for depressive symptoms. About 20% had a feeding tube at the time of 1-year survey, but only 4% had a tracheotomy. The types of treatment received for head and neck cancer during the first year after diagnosis included radiation (83%), chemotherapy (62%), and surgery (47%). Most of the subjects underwent a combination of these treatment procedures (Table 2).

At baseline, 50% of patients with head and neck cancer had smoked within the last month while only 21% smoked in the last month at 1-year follow-up. While 25% of the sample screened positive for baseline problem drinking, only 11% screened positive at 1-year follow-up. Mean calories per day decreased almost 300 calories per day from 2100 to 1828 at 1-year follow-up. Mean BMI was 26.6 at baseline and decreased by 2.6 points to 24.0 at 1-year follow-up. The mean physical ac-

Table 1. Baseline demographics of newly diagnosed head and neck cancer patients ($N = 283$).

Variable		No. of patients (%)
Age, y		
Mean (SD)	59.4 (11.1)	
Range	25–88	
Sex		
Male		220 (77.7)
Female		63 (22.3)
Race		
Non-Hispanic white		241 (85.2)
Nonwhite/Hispanic		42 (14.8)
Marital status		
Married		170 (60.3)
Not married		112 (39.7)
Educational level		
High school or less		146 (52.0)
Some college or more		135 (48.0)
Hospital site		
University of Michigan Medical Center		207 (73.1)
VA Ann Arbor Healthcare System		31 (11.0)
Henry Ford Health System		45 (15.9)

tivity score was 115 and decreased by about 25% to a low point of 85 at 3 months, but then slowly rose to slightly above baseline levels at 1-year follow-up. The mean sleep score was 67 and stayed fairly constant throughout the year (Table 3).

Over the course of the year, 17% (48) died and 9% (25) were lost to follow-up at 1 year. Hence, 1-year analyses included fewer respondents than baseline analyses. Those who completed a 1-year survey had slightly different characteristics than those who were lost to follow-up. Bivariate analyses showed that those who died or were lost to follow-up at 1-year were significantly more likely to be older, be a smoker, have a high school education or less, stage III and IV cancer, moderate-to-severe comorbidities, lower BMI, and lower physical activity scores than those who had not died and were not lost to follow-up.

Predictors of Baseline and 1-Year Health Behaviors. Logistic regression analyses were conducted to determine factors associated with baseline and 1-year smoking and problem drinking. Factors associated with smoking: problem drinking and not being married were strongly associated with both baseline and 1-year smoking; age and depression were not associated with smoking at either time point. Factors associated with problem drinking: smoking and younger age were associated with both baseline and 1-year drinking; males were significantly more likely to be problem drinkers at baseline only (Table 4).

Linear regression analyses were conducted to determine factors associated with baseline and 1-year calorie intake, BMI, physical activity scores, and SLEEP scores. Factors associated with caloric intake: at baseline, none of the independent variables were associated with baseline caloric intake in the multivariate analysis. Having pharyngeal cancer was significantly associated with lower caloric intake at 1 year; however, the overall regression model was not significant. Factors associated with lower BMI: smoking, problem drinking, older age, and more education were significantly associated with lower baseline and 1 year BMI; additionally, lesser sleep, being Hispanic or nonwhite, and having a feeding tube at 1 year was associated with lower 1-year BMI. Factors associated with lower physical activity levels: lower SLEEP scores, older age, being not married, having moderate to severe comorbidities, and having cancer of the oral cavity were significantly associated

Table 2. Baseline health characteristics of newly diagnosed head and neck cancer patients.

Variable	Number of patients (%)
Tumor site	
Larynx	76 (26.9)
Pharynx (Oro, Hypo, Naso, Unknown Primary)	146 (51.6)
Oral cavity/Sinus	61 (21.5)
Tumor stage	
0, I, II	59 (20.9)
III, IV	224 (79.1)
ACE-27 comorbidity score	
None/mild	188 (66.4)
Moderate/severe	95 (33.6)
Depressive symptoms	136 (50.0)
Radiation treatment during year 1 ($N = 261$)	217 (83.1)
Chemotherapy during year 1 ($N = 257$)	159 (61.9)
Any surgery during year 1 (excluding biopsies) ($N = 264$)	125 (47.4)
Current feeding tube at 1 year survey ($N = 215$)	42 (19.5)
Current tracheotomy at 1 year survey ($N = 215$)	8 (3.7)
Modalities of Treatment ($N = 255$)*	
None	3 (1.2)
Chemotherapy alone	2 (0.8)
Radiation alone	26 (10.2)
Surgery alone	38 (14.9)
Radiation and surgery	31 (12.1)
Radiation and chemotherapy	101 (39.6)
Radiation, chemotherapy, and surgery	54 (21.2)

Abbreviations: ACE, Adult Comorbidity Evaluation.
**Twenty-eight people had missing data for 1 or more of the treatment modalities.*

Table 3. Health behaviors during the first year after diagnosis.

Variable	Baseline ($N = 283$)	3-Month ($N = 200$)	6-Month ($N = 190$)	9-Month ($N = 181$)	1-Year ($N = 210$)
Current smoker (within 1 mo)	50% (140/282)	28% (55/196)	22% (40/184)	19% (34/176)	21% (44/205)
Alcohol problem (AUDIT $\geq$ 8)	25% (69/279)				11% (21/200)
Mean calories per day (kcal) (RDA 2000 kcal)	2100				1828
Mean BMI (normal 18.5–25; pop. mean about 28–29)	26.6	25.0	24.4	23.8	24.0
Mean PASE score (pop. mean 103)	114.7	84.9	106.3	109.8	126.4
Mean SLEEP score (pop. mean 72)	66.9	65.6	68.7	70.0	67.2
Not returned (% of total)	0	25.1% (71/283)	24.7% (70/283)	22.3% (63/283)	8.8% (25/283)
Deceased (cumulative % of total)	0	4.2% (12/283)	8.1% (23/283)	13.8% (39/283)	17.0% (48/283)

Abbreviations: AUDIT, Alcohol Use Disorders Identification test; kcal, kilocalorie; RDA, recommended dietary allowance; BMI, body mass index; pop, population; PASE, Physical Activity Scale for the Elderly; SLEEP, Medical Outcomes Study Sleep Scale.

with lower baseline and 1-year physical activity scores; having stage III or IV cancer was associated with lower baseline physical activity scores only, while having a feeding tube was associated with lower 1-year physical activity scores. Factors associated with lower SLEEP scores: younger age and depressive symptoms were associated with lower SLEEP scores at baseline and 1-year; low physical activity scores, and smoking were significantly associated with lower SLEEP scores at baseline only, while not being married was associated with lower SLEEP scores at 1-year only. Those with cancer of the oral cavity had improved SLEEP scores at baseline only (Table 5).

DISCUSSION

The major finding of this study is that the health behaviors of patients with head and neck cancer were highly interrelated. For example, smoking and problem drinking were highly associated, and both were associated with decreased BMI. Moreover, physical activity and sleep were associated and low SLEEP scores were common and highly associated with depression. A more detailed discussion of these major findings and treatment recommendations follow.

Smoking and Problem Drinking. Both smoking and problem drinking declined by over 50% the first year after diagnosis. For some, a cancer diagnosis presents a "teachable moment"[25] that motivates patients to quit immediately. However, refraining from the addictive behaviors of smoking and problem drinking can be extremely stressful and difficult, especially during the diagnostic and treatment period. Hence, about 1 in 5 continued to smoke and 1 in 10 continued to drink at problem-

Table 4. Predictors of baseline and 1-year smoking and problem drinking dependent variables: Multivariate logistic regression odds ratios.

Independent variables	Smoker baseline ($N = 269$; OR, 95% CI)	Smoker 1-year ($N = 199$; OR, 95% CI)	Problem drinking baseline ($N = 278$; OR, 95% CI)	Problem drinking 1-year ($N = 200$; OR, 95% CI)
Smoker baseline			4.6 (2.4–8.7)*	8.0 (2.2–28.9)*
Alcohol problem baseline	4.1 (2.2–7.8)*	3.2 (1.5–6.9)*		
Depressive symptoms baseline	1.2 (0.70–2.0)	1.2 (0.59–2.5)		
Age (in decades)	0.87 (0.68–1.1)	0.96 (0.66–1.4)	0.63 (0.46–0.87)*	0.49 (0.27–0.89)**
Married	0.56 (0.33–0.96)**	0.33 (0.16–0.67)*		
Female			0.18 (0.07–0.47)*	0.26 (0.06–1.2)

Abbreviations: OR, odds ratio; CI, confidence interval.
Note: Because of the limited number of smokers and drinkers at 1 year, fewer predictors were used in these logistic regression analyses. For smoking, only alcohol problem, depressive symptoms, age, and marital status were included. For problem drinking, only smoking, age, and sex were included.
*$p < .01$, **$p < .05$.

Table 5. Predictors of baseline and 1-year calories, BMI, PASE, and SLEEP dependent variables: Multivariate linear regression parameter estimates.

Independent variables	Calories baseline ($N = 238$)	Calories 1-year† ($N = 160$)	BMI baseline ($N = 269$)	BMI 1-Year ($N = 202$)	PASE baseline ($N = 269$)	PASE 1-Year ($N = 202$)	SLEEP baseline ($N = 269$)	SLEEP 1-Year ($N = 201$)
Smoke baseline	180.9	35.9	−2.7*	−2.4*	−16.1	0.4	−4.7*	−0.8
Alcohol problem baseline	31.7	−203.9	−2.9*	−2.4*	10.8	−20.7	5.0	0.6
BMI baseline	5.9	−10.5			0.5	0.4	0.3	0.4
PASE (10 points) baseline	13.9	9.3	0.02	−0.02			0.5*	0.2
SLEEP (10 points) baseline	−40.8	−13.7	0.3	0.4**	10.2*	11.0*		
Age (in decades)	−59.3	−86.4	−1.1*	−1.1*	−18.5*	−18.7*	3.9*	3.8**
Married	−206.9	−156.6	0.7	0.2	20.4**	27.5**	−1.3	6.3**
High school or less	159.1	156.7	1.8**	1.8*	−18.9	−11.7	−3.2	−0.2
Non-white	−137.8	−160.6	−1.7	−2.2**	−4.8	−9.1	0.2	−4.0
Female	−283.9	−99.2	0.8	−0.4	−6.3	−20.0	−3.8	1.3
Oral cancer (vs. larynx)	58.6	51.3	−1.2	−0.08	−27.3**	−45.5**	7.0**	−1.7
Pharynx cancer (vs. larynx)	−57.6	−421.3*	−0.4	−1.0	−10.4	−7.0	3.7	0.5
Stage 3/4	−122.5	218.9	0.8	−1.7	−43.1*	−8.3	−2.2	−0.9
Moderate/severe comorbidity	218.9	−186.5	0.4	0.5	−26.6*	−41.0*	−1.3	−3.0
Depressive symptoms baseline	156.1	−70.7	0.9	1.0	13.9	9.4	−20.1*	−13.3*
Radiation		92.7		1.2		−41.7		−7.5
Surgery		−223.9		−0.9		−10.3		−3.6
Feeding tube at 1 year		−183.0		−1.7**		−59.9*		−3.3

Abbreviations: BMI, body mass index; PASE, Physical Activity Scale for the Elderly; SLEEP, Medical Outcomes Study Sleep Scale.
Note: Treatment variables were not included in the baseline regression analyses. Health behaviors were not included as a predictor variable in regressions where they are the independent variable.
*$p < .01$, **$p < .05$.
†*The regression model for 1-year calories was not significant.*

atic levels at 1-year follow-up. Smoking and problem drinking were interrelated, with smokers more likely to be problem drinkers and problem drinkers more likely to be smokers. Unfortunately, continued smoking and problem drinking after the first diagnosis of head and neck cancer significantly increases medical complications (especially those related to surgery and radiation)[26] and increases the likelihood of developing a second malignancy, which adversely affects survival.[27] Intensive treatment strategies need to be employed for those remaining recalcitrant smokers and drinkers who are unable or unwilling to quit even in the face of cancer caused by these poor health habits.

For smokers, nicotine replacement therapies may increase quit rates and reduce the discomfort associated with nicotine withdrawal. Bupropion can also enhance quit rates and may also be effective in treating comorbid depression. Combination nicotine replacement therapy and bupropion can be used for those having a difficult time quitting. If these more common cessation medications fail, varenicline may also be used, however, more careful monitoring is required. In addition, brief interventions, referrals to smoking cessation clinics, telephone quit lines, internet smoking cessation programs, and print materials are all strategies that providers can recommend to patients.

For some, treatment for alcohol use must first take place before smoking cessation or other interventions can be accomplished. For those who are highly alcohol-dependent, inpatient detoxification programs may be needed. For others, referrals to outpatient and community-based programs such as Alcoholics Anonymous are effective strategies.

Behavioral therapy, such as cognitive behavioral therapy, has been proven effective in patients with smoking, and substance abuse problems. Behavioral therapies can increase patients' awareness of the interconnectedness of these health behaviors. For example, stressful life events (such as a cancer diagnosis) can precipitate depression and alcohol misuse, which are both

major triggers for smoking relapse. Assisting patients to identify relapse prevention coping strategies can ensure long-term successful treatment of these interrelated behaviors. "Brief advice" delivered by physicians has been found to be effective.[28,29] It has also been shown that nurses can effectively and economically deliver the interventions to treat smoking and substance abuse behaviors.[30,31]

Calories, Body Mass Index, and Physical Activity. Weight loss is often a presenting symptom among new head and neck cancer patients and during active cancer treatment, preventing weight loss is 1 of the most important nutritional goals. While the overall model was not significant, those with cancer of the pharynx ate significantly fewer calories 1 year after diagnosis, most likely due to swallowing problems. Surprisingly, no other variables were associated with baseline or 1-year calorie intake.

The mean baseline BMI of the sample was lower (in the normal range) than the population mean for U.S. adults ages 50 to 74[16] (in the overweight range), perhaps due to a new cancer diagnosis or the high number of smokers in the study. Leanness may enhance oxidative DNA damage induced by smoking and thus serve as a marker of host susceptibility to cancer.[32] Smoking and problem drinking were both associated with decreased BMI. Despite having lower BMIs, smokers and problem drinkers, including those in this study, have been shown to have levels of caloric intake similar to those of nonsmokers and nondrinkers, suggesting that nutrients may be less efficiently utilized by smokers and problem drinkers.[33,34] In addition to treatment for addictions, smokers and problem drinkers may benefit from closer nutritional intervention, which has been found to minimize weight loss and improve quality of life and physical functioning.[35] Referrals to nutritionists are beneficial for many cancer patients. Assisting patients to make a connection between the potential for weight loss associated with smoking and alcohol use may also prove to be beneficial.

While mean physical activity scores declined during the first year of treatment, they were slightly above population means at baseline and 1-year follow-up, probably due to the younger age of the sample than the population on which the PASE was validated. Those at risk for poor physical activity 1-year post diagnosis are those who are older, not married, have sleep problems, have oral cancer, have moderate to severe comorbidities, and have feeding tubes. Disfigurement related to oral cancer may inhibit going out in public due to embarrassment. Those with feeding tubes may be less active because of fear of dislodging the tube. While little is known about the effects of physical activity on cancer outcomes, physical activity has been shown to improve survival among patients with breast cancer[36] and improve fatigue and psychological distress among patients with cancer.[37] Moderate exercise may "enhance the immune system, decrease susceptibility to infection, enhance the immune surveillance for cancer cells, slow the course of cancer, and increase quality of life."[38] Hence, efforts to identify these risk factors and encourage physical activity or physical rehabilitation would seem to be logical recommendation to these patients in particular.

Sleep. At baseline, oral cavity cancer patients had better SLEEP scores than those with laryngeal cancer, probably due to airway issues. Similar to other studies of cancer patients,[39] the SLEEP scores of this sample of patients with head and neck cancer were lower than population means at clinically relevant levels. The etiology of sleep problems among cancer patients is not easy to determine and is likely to be multifactorial and, at the very least, related to pain, fatigue, and psychological distress.[40] Patients with head and neck cancer may also have sleep problems related to excess oral secretions, xerostomia, and pain. Behavioral interventions to treat sleep include advice to keep a regular sleep and waking schedule, use bed only for sleep (as opposed to watching television or reading), and avoid exposure to light when getting up during the night. Pharmaceutical aids can be used as a second line of defense if behavioral interventions are ineffective; however, before initiating pharmacotherapy, the underlying causes of insomnia should first be assessed and treated.[41]

Depression, which is common in the head and neck cancer population, should be considered when assessing sleep problems. Similar to other studies,[42] our data show that depressive symptoms were strongly associated with decreased sleep at baseline and 1-year post-diagnosis more so than all demographic, clinical, and treatment variables. Although not shown in this study, depression has been shown in other populations to be associated with smoking,[43] alcohol use,[44] a poor diet, and lack of exercise.[45] Depression can influence the degree to which people are motivated to adhere to their medical regimens,[46] and can be a risk factor for overall mortality.[47] Fortu-

nately, when depression is detected, both behavioral and pharmaceutical interventions are available and are likely to yield substantial benefits in sleep as well as improvements in other health behaviors and quality of life.

Demographic and Clinical Variables Associated with Health Behaviors. Being married was associated with several health behaviors including 1-year smoking, higher physical activity, and improved sleep. Marriage is a marker for social support, and survival rates are better for married persons and those not living alone compared with those not married or living alone.[48,49] Unmarried patients with head and neck cancer may benefit from referral to smoking cessation classes, nutritional classes, physical activity counseling, or cancer support groups. Having more than a high school education was associated with low BMI. Taking an educational history may help with many aspects of caring for head and neck cancer patients including tailoring patient communication and providing materials at appropriate reading levels. While the incidence of head and neck cancer is greater among black men compared with white men,[50] surprisingly there were few racial disparities in health behaviors in this sample, with race only associated with 1-year BMI. As one might expect, older persons drink less, have lower BMI, have lower physical activity scores, and have higher SLEEP scores. Similar to other studies,[51] women report less problem drinking than men at baseline.

Interestingly, there were almost no associations between the independent variables and baseline and 1-year caloric intake and the overall models were not significant. This may be because even the best food frequency questionnaires rely on patient recall which may produce inaccurate results. Also, nutritional variables consisted of calories and BMI and did not include a micronutrient analysis. Also surprising was that radiation and surgery were not associated with caloric intake, BMI, physical activity, or sleep, perhaps because most patients were treated with multiple modalities which may make and independent effect difficult to detect. Since chemotherapy and radiation therapy were highly collinear, only radiation could be included in the analysis.

Delivery of Health Behavior Services. Unfortunately, there are many barriers to the efficient delivery of behavioral therapies in most cancer clinics. Clinic personnel concerned with treating the physical aspects of the disease are often too busy to attend to health behavior problems, some of which are often difficult to detect and treat (such as smoking and drinking). While patients are referred to specialty clinics such as psychiatry, smoking cessation, substance abuse, and nutrition services, access to care is difficult for many because of the debilitating effects of the cancer, multiple medical visits and long distances traveled to the hospital, and poverty associated with the disease.

Since medical and nursing programs do not routinely provide education regarding the treatment of health behaviors, clinicians have been shown to be uncomfortable providing these services;[52] however, continuing educational programs can ensure that state-of-the-art treatment for these health behaviors is provided. Standardized interventions, clinical guidelines, and resources to treat these health behaviors must be readily available to providers including print materials, and knowledge of referral agencies. To avoid the perception of providers that delivering these services are "extra work," clear expectations and time to deliver these services must be available. While the treatment of health behaviors presents organizational challenges, these services are essential to improve the quality of life and survival of cancer patients.

Limitations of the Study. Despite efforts to recruit patients from a VA and inner-city hospital, the number of nonwhites was only 15%, yet big enough to detect some differences in the analyses where race was included. Approximately 9% of the baseline sample was lost to follow-up at 1-year, which may bias the 1-year analysis. The number of patients available for these analyses was limited, which restricted the number of predictor variables that could be included, particularly in the smoking and alcohol logistic regression analyses. As the study continues to accrue patients, the relationship between health behaviors and quality of life, cancer recurrence, and survival will be determined.

CONCLUSION

The overall findings indicate that the health behaviors of patients with head and neck cancer are highly interrelated. It may be much more difficult to get people to stop smoking if they are problem drinkers and both smokers and problem drinkers are at greater risk for low BMI. Moreover, physical activity and sleep are interrelated

and low SLEEP scores are correlated with depression. Thus, a comprehensive health behavior assessment with follow-up treatment may be more beneficial than treating each health behavior in isolation.

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