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Health behaviors, readiness to change, and interest in health promotion programs among smokers with lung cancer and their family members: a pilot study

Mary E. Cooley, PhD, RN¹, Kathleen T. Finn, MSN³, Qian Wang, PhD¹, Kristin Roper, PhD(c)¹, Sandra Morones, BSN, RN², Ling Shi, PhD², Dan Litrownik, BA⁴, J. Paul Marcoux, MD¹, Ken Zaner, MD, PhD³, and Laura L. Hayman, PhD, RN, FAAN²

¹Dana-Farber Cancer Institute, Boston, Massachusetts

²University of Massachusetts, Boston, Massachusetts

³Boston Medical Center, Boston, Massachusetts

⁴Beth Israel Deaconess Medical Center, Boston, Massachusetts

Introduction

Lung cancer is the second most common cancer and the number one cause of cancer death among men and women in the United States¹. Smoking continues to be the major risk factor for lung cancer. Given that lung cancer is a smoking-related malignancy, the prevalence of smoking tends to be twice as high among this group of patients and family members as compared to the general population². Smoking cessation is essential for the prevention of lung cancer and also after the diagnosis to enhance the efficacy of cancer treatment, decrease recurrence and enhance survival^{3–5}. Although the majority of patients with lung cancer attempt to quit smoking, smoking relapse rates are high and the uptake of formal smoking cessation programs is low as the majority of smokers prefer to quit on their own after the diagnosis^{6–8}. Innovative ways of delivering these services are needed. Evidence exists that putting smoking cessation services into a context that addresses multiple health behaviors has been associated with successful behavioral change^{9–12}.

Smokers often have multiple risk behaviors which include lower levels of physical activity and lower consumption of fruits and vegetables¹³. The diagnosis of lung cancer presents a unique opportunity to motivate individuals to adopt health promoting behaviors¹⁴. Although there are a growing number of research studies that address health promotion for individuals diagnosed with cancer, little attention has been given to using this opportunity to also motivate relatives of cancer patients to change their health behaviors. Targeting patients and their family members may enhance adoption of healthy behaviors since behaviors tend to cluster within families^{15–17}. Information about the prevalence of current health behaviors

Correspondence: Mary E. Cooley, PhD, RN, Phyllis F. Cantor Center, Research in Nursing and Patient Care Services, Dana Farber Cancer Institute, 450 Brookline Ave, LW 521, Boston, MA 02115 (mary_cooley@dfci.harvard.edu).

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and motivational readiness to change lifestyle among smokers with lung cancer and their family members are the first steps needed to inform the development of future interventions.

Background

Although there have been a multitude of studies that have examined health behaviors among cancer survivors with heterogeneous types of cancer^{18–23}, only two studies examined the prevalence of current health behaviors in lung cancer survivors. Evangelista and colleagues²⁴ examined health behaviors among 142 survivors of lung cancer and found that 13.4% continued to smoke, 28% were exposed to second hand smoke, 58% drank alcohol and 51% were overweight. Kreps and colleagues²⁵ conducted the second study which examined health behaviors among patients with early stage lung cancer and found that 5.5% of patients continued to smoke after their diagnosis, 5.4% of men and 17.3% of women exceeded recommendations for alcohol use and 23% met physical activity guidelines

In order to facilitate behavioral change, an understanding of an individual's motivational readiness to change lifestyle is essential to plan optimal interventions. Only one study examined motivational readiness related to physical activity among lung cancer patients²⁶. Results of this study showed that 37% of patients participated in physical activity (action stage), 17% were preparing to start exercising (preparation), 22% were thinking about starting to exercise in the next 6 months (contemplation), and 25% were not thinking of increasing their physical activity (pre-contemplation).

Few studies examining health behaviors have been conducted in family members of cancer patients. One study assessed the attitudes of relatives of patients with smoking and diet-related malignancies toward risk behaviors and found a high rate of interest and willingness to discuss these issues (99%)²⁷. One study assessed smoking and alcohol use among family members of women with lung cancer and found that family members were more likely to continue smoking (18% vs. 4%) and drink alcohol (71% vs. 43%) as compared to those who were diagnosed with lung cancer²⁸.

Health behaviors tend to be similar and cluster among family members. Several studies have examined concordance of health behaviors and health behavior change among community dwelling spouses and found that when one member of the dyad improves his or her behaviors, the other spouse is likely to do so^{15–17,29}. Only one study assessed concordance of smoking among patient-family member dyads with lung or colorectal cancer³⁰. Patient and caregiver smoking status was significantly associated in lung but not colorectal cancer. An important finding from this study was that mental health-related quality of life (HR-QOL) was significantly impaired among dyads in which one or both members continued smoking. These findings underscore the importance of assessing smoking status and providing cessation and supportive care services for patients and family members with cancer.

Taken together these studies suggest that targeting the family for health promotion activities is important and may be beneficial in enhancing uptake of health promotion behaviors. Few health promotion studies have been conducted within the context of lung cancer and none of these studies have examined concordance of multiple health behaviors among patients and

their family members. Thus, this study extends the literature by examining current health behaviors and motivational readiness to change health behaviors among smokers with lung cancer and their family members and the concordance of health behaviors. Smokers with lung cancer were targeted in this study since there is evidence suggesting that smoking cessation rates may be enhanced by placing smoking cessation services in the context of other health behaviors. Given that smoking rates tend to be twice as high among lung cancer patients and their family members as compared to the general population, increasing uptake of cessation services within this population is critical to enhance outcomes for patients and their family members^{2,31}.

The aims for this study were to: 1) Describe current health behaviors and motivational readiness to pursue behavioral change; 2) Identify interest and preferences for participating in health promotion programs; and 3) Examine lung cancer patient-family member concordance among health behaviors. The health behaviors of interest for this study were diet, alcohol use, physical activity and smoking. The American Cancer Society's (ACS) guidelines for health promotion³² were used to guide this study and were defined as diet that includes at least 5 fruits/vegetables per day, limit alcohol use to 1 drink per day for women and 2 drinks per day for men, exercise for at least 30 minutes per day on 5 days per week, and no smoking.^{14,33}

Theoretical Framework

The "Health Behavior Model in Vulnerable Populations" and the "Teachable Moment" were the frameworks that guided this study^{14,33}. The diagnosis of lung cancer provides an opportunity, also known as a "Teachable Moment", to increase the use of health promoting lifestyle behaviors. For those that need it, a change in health promoting lifestyle behaviors such as increasing physical activity, improving diet, and quitting smoking are necessary in order to improve health outcomes³². Multiple studies have shown a positive relationship between lifestyle behaviors meeting ACS recommendations for cancer prevention and health outcomes such as improved function, improved HR-QOL and increased survival^{23,34,35}.

The "Health Behavior Model for Vulnerable Populations"³³ posits that certain predisposing characteristics such as age, gender, socioeconomic status, race and comorbidities affect health outcomes and that an underlying mechanism may be that predisposing, enabling and perceived need components of the model directly influence personal health behaviors, which in turn affect HR-QOL and other clinical outcomes³³. The "Teachable Moment" provides the framework for the enabling variables in the current study. McBride and colleagues¹⁴ propose that a teachable moment, is a process of "sense-making" in which individual's seek to interpret the significance, cause and meaning of the sentinel event. This event prompts one to experience an increase in perception of personal risk and vulnerability. This cognitive response precedes motivational readiness to change health behaviors, acquisition of skills and self-efficacy which affect the likelihood of behavioral change.³⁶ In this study, we focused on understanding the enabling variables of motivational readiness to change and concordance of patient-family member dyad health behaviors; as the family environment can support or undermine behavioral change. The perceived need variables of interest in this

study were interest in health promotion programs and the health behaviors of interest were smoking cessation, physical activity, diet and alcohol.

Methods

Design, participants and settings

This *pilot study* used a descriptive, cross-sectional research design. Identification of potential participants occurred from the thoracic oncology clinics at Boston Medical Center and Dana-Farber Cancer Institute. Institutional Review Board approval was obtained from both clinical sites. All sequential patients seen in the thoracic oncology department were screened for eligibility into the study. Inclusion criteria for patients were: black or white race, 18 years of age, English speaking, diagnosis of lung cancer, performance status of 1, current smoker or recent quitter and having a family member willing to participate in the study. Inclusion criteria for family members were 18 years of age, English speaking, and either a spouse, unmarried partner or adult child.

Instruments

Performance status was measured with the Eastern Cooperative Oncology Group Performance Status Questionnaire³⁷. This questionnaire consists of categories describing performance status, which include: 0= Active (fully ambulatory), 1=Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, 2= Ambulatory and capable of all self care but unable to carry out any work activities. Up and about more than 50% of waking hours, 3=Capable of only limited self care, confined to bed or chair more than 50% of waking hours, 4= Completely disabled. This questionnaire is used widely in cancer clinical trials.

Demographic variables of interest for this study were obtained from self-report and included age, gender, race, comorbidities, and marital status. Comorbidities were measured with the Human Population Laboratory Comorbidity Questionnaire, which has been used in previous studies. This questionnaire assesses 20 different chronic conditions. The patient is asked whether they have ever been diagnosed with that condition. The comorbidity score is obtained by adding the total number of comorbidities identified by the patient. This questionnaire has been used extensively in epidemiological studies and in cancer patients and was predictive of survival among breast cancer patients^{38,39}

Clinical variables were obtained from the medical record. The variables of interest for this study included stage of disease, histology, type of cancer treatment for patients, and height and weight for patients and their family members, which was used to calculate body mass index (BMI; kg/m²). Height and weight were obtained from the medical record for patients and family members provided self-report data.

Current smoking was defined by self-reported smoking status. Participants were asked whether they smoked cigarettes every day or some days. This definition is used in national surveys to track prevalence of smoking among the general population⁴⁰. We also included those who reported that they quit smoking within the last six months because they are at high risk for relapse and may be transient quitters^{41,42}.

Diet was defined by current daily intake of fruits and vegetables. A single item asking how many serving of fruits and vegetables are eaten each day was used to measure daily intake of fruits and vegetables. This item has been used in previous studies of patients with cancer and the general population^{23,43}.

Alcohol use was measured with a single item that asked the participants on a typical day, how many drinks are consumed. In addition, the CAGE questionnaire was used to assess for hazardous alcohol use. The CAGE is a simple 4-question test that is a widely used questionnaire to screen for hazardous alcohol use. Each yes response is scored as a 1. Scores range from 0–4. It is considered a validated screening technique with one study determining that CAGE scores > 2 had a sensitivity of 93% and a specificity of 76% for identification of problem drinkers^{44,45}.

Current level of physical activity was measured by an adapted version of the Godin Leisure Time Questionnaire^{43,46}. The participant is asked how many days a week they engage in physical activity that causes them to work up a sweat and causes their heart to thump. This questionnaire has been used in epidemiological studies and has been used extensively in cancer patients^{23,43}. Evidence for construct and predictive validity are available⁴⁶.

Motivational readiness to change was measured by asking participants “are you seriously thinking about changing your behavior within the next 30 days or 6 months?” This question provides information about the stage of behavioral change and has been used to predict future behavioral change and to tailor behavioral change interventions (i.e. not thinking of change= pre-contemplation, thinking of change within the next 6 months= contemplation, thinking of change within the next 30 days= preparation)^{47,48}. This question was asked in the context of smoking, diet, and physical activity.

Interest in participation in health promotion programs was ascertained by asking a single item about how interested participants are in participation in a health promotion program from 1 (not at all interested) to 5 (extremely interested).

Procedures

Eligible patients were provided with information about the study and their questions were answered. For those who were interested in participation, they were asked to identify a potential family member who may be interested in participating in the study and discuss the study with them. Among interested participants, a mutually agreeable time was set to provide information about the study and answer any questions that they may have had. Written informed consent was obtained from both members of the dyad.

Data were collected once by phone or an in- person interview; data collection was done separately for patient and family members. Some families were unable to attend the clinic due to competing demands so data were collected by phone. Evidence exists that collection of data related to behaviors is similar when collected by phone or in-person^{49,50}. All data collected for patients and families were the same except for: family relationship to the patient, stage of disease, histology and type of cancer treatment. These data were collected for patients only as they were not relevant for family members.

A standardized questionnaire guided the interview. If data were collected by a phone interview, participants received a copy of the questionnaire before the interview to enhance understanding of the questions and expedite data collection. The research assistant reviewed all questions to make sure that answers were obtained before ending the interview. A \$10.00 gift card was given to patients and their family member as a small token of appreciation for their efforts after completing the questionnaires.

Data Analysis

First, descriptive statistics were used to describe current health behaviors and motivational readiness to pursue behavioral changes, and to identify interests and preferences for participating in health promotion programs among patients and their family members. Next, each of the health behaviors of interest - smoking, diet, alcohol use, and physical activity was dichotomized as meeting the ACS guidelines for health promotion or not. Then, lung cancer patient-family member concordance was examined by estimating the percentages of both meeting guidelines, patients only meeting guidelines, family members only meeting guidelines, and neither meeting guidelines for each of the 4 health behaviors of interest, and corresponding 90% 2-sided exact binomial confidence intervals were provided. All the analyses were conducted in SAS (version 9.2).

Results

Sample

At Boston Medical Center, 128 patients were screened for eligibility and of these 36 (28%) were eligible and 6 (17%) completed data collection, whereas at Dana-Farber Cancer Institute, 1,563 patients were screened and of these 132 (8%) were eligible and 31 (24%) completed data collection. All together, the total number of dyads enrolled from both site was 37. The most common reasons for not being eligible for the study from Boston Medical Center were; smoking status (n=51[55%]), too sick or died (n=10[11%], performance status (n=12[13%], no family member (n=2[2%], race/ethnicity (n=10[11%]) and other (n=7[8%]. The most common reasons for not being eligible for the study from Dana-Farber Cancer Institute were smoking status (n=803 [56%]), too sick or had died (n=228 [16%]), not lung cancer (n=233 [16%]), performance status > than 1 (n=111 [8%]), and no family member (n=24 [2%].

As displayed in Table 1, the median age of patients in the sample was 59 (range 45–76) years and the median age of family members was 49 (range 18–65) years. Forty-six percent (n=17) of family members in the sample were spouses, 11% (n=4) were unmarried partners and 43% (n=16) were adult children. Fifty-four percent (n=20) of patients were male and 46% (n=17) were female, whereas 30% (n=11) of family members were male and 70% (n=26) were female. Forty-six percent (n=17) of patients in the sample had early stage (stages I, II, IIIA) disease and 54% (n=20) had late stage (IIIB, IV) disease. The median number of comorbidities was 2 (range 0–7) among patients and 1 (range 0–8) among family members. The most common comorbidities among patients and their family members were hypertension (38% vs. 11%), asthma (24% vs. 22%) and arthritis (32% vs. 22%).

Aim 1 Describe current health behaviors and motivational readiness to pursue behavioral change—

Forty-three percent (n=16) of patients continued to smoke after their diagnosis and 57% (n=21) were recent quitters, 8% (n=3) met dietary suggestions of eating 5 fruits and vegetables per day, 16% (n=6) had hazardous use of alcohol and 16% (n=6) met suggestions for physical activity of 30 minutes a day on 5 days of the week. Thirty-five percent (n=13) of patients were within guidelines for optimal weight as calculated by body mass index and 57% (n=21) were overweight, 3% (n=1) were underweight and 5% (n=2) were missing. As Figure 1 shows, the majority of patients had at least 2 risky health behaviors and 32% of patients had 3 risky behaviors. The mean number of risk behaviors for patients were 2.3 and none of the patients met all of the recommendations for four (no smoking, diet, exercise and alcohol use) life style behaviors.

Thirty-percent (n=11) of family members continued to smoke after the diagnosis of cancer in their relative and 11% (n=4) were recent quitters, 5% (n=2) met dietary suggestions of eating 5 fruits and vegetables per day, 14% (n=5) had hazardous use of alcohol and 16% (n=6) met suggestions for physical activity of 30 minutes a day on 5 days of the week. Twenty-four percent (n=9) of family members were within guidelines for optimal weight as calculated by body mass index, 67% (n=25) were overweight and data was missing for 8% (n=3). As Figure 1 illustrates, the majority of family members had at least 2 risky health behaviors and 24% had 3 risky behaviors. The mean number of risk behaviors for family members were 2.2 and one (3%) family member met all four recommendations for life style behaviors.

Sixty-three percent (n=10) of patients who were current smokers (n=16) indicated motivational readiness to quit smoking within 30 days and 25% (n=4) indicated readiness to quit smoking within six months. Fifty-eight percent (n=19) of patients who considered themselves not meeting the diet recommendations (n=33) indicated motivational readiness to change their diet within 30 days and 15% (n=5) indicated readiness to change within six months. Thirty-three percent (n=9) of patients who considered themselves not meeting the physical activity recommendation indicated motivational readiness to increase their physical activity within 30 days and 30% (n=8) indicated readiness to increase their physical activity within 6 months.

Fifty-five percent (n=6) of family members who were current smokers indicated motivational readiness to quit smoking within 30 days and 36% (n=4) indicated readiness to quit smoking within six months. Forty-two percent (n=13) of family members who considered themselves as not meeting the dietary recommendations indicated motivational readiness to change their diet within 30 days and 16% (n=5) indicated readiness to change within six months. Forty-eight percent (n=10) of family members who considered themselves as not meeting the recommendations for physical activity indicated a motivational readiness to increase their physical activity within 30 days and 33% (n=7) indicated readiness to increase their physical activity within 6 months.

Aim 2 Identify interest and preferences for participating in health promotion programs—

Interest in participating in a health promotion program was high among patients and their family members as 84% (n=31) of patients indicated an interest as

compared to 92% (n=34) of family members. The majority of patients (68%) and their family members (81%) indicated that they were interested in a multi-component type of program. As Table 2 indicates, the most common types of program components preferred by patients and their family members were receiving a mailed brochure, videotapes and an interactive component (one-on-one counseling, group format or internet based program).

In addition to a multi-component program, patients and their family members indicated that they were interested in addressing multiple health behaviors as part of a health promotion program. As Figure 2 shows, patients were most interested in addressing exercise and stress management whereas family members were most interested in addressing diet, exercise and stress management.

Aim 3 Examine lung cancer patient-family member concordance among health behaviors—As Table 3 indicates, the percent agreement for health behaviors among lung cancer patient-family member dyads was 70% for smoking status (49% for not smoking [90% CI 34–63%] and another 22% for both smoking [90% CI 11–36%]), 86% for a diet that had less than 5 fruits and vegetables a day [90% CI 74–95%]), 84% for alcohol use (75.0 % for adhering to moderate use of alcohol [90% CI 59–87%] and another 9% for both exceeding moderate use of alcohol [90% CI 3–22%]), and 78% for physical activity (73% for not exercising 5 days a week for 30 minutes per day [90% CI 58–85%] and another 5% for both exercising 5 days a week for 30 minutes per day [90% CI 1–18%]).

Discussion

Smokers with cancer in this study continued to have relatively high rates of smoking (47%) after their diagnosis and rates of smoking among family members were higher (30%) than rates (19%) found among the general population underscoring the addictive nature of tobacco use⁵¹. Moreover, dietary intake of fruits and vegetables was lower among *smokers and recent quitters with lung cancer (n=3, 8%) and their family members (n=2, 5%)* than other groups of cancer survivors (15–19%) and levels of physical activity were lower (16% for patients and 16% for family members) as compared to other cancer survivors (30%)²³. More than half of patients and their family members were overweight, which is higher than the general population⁵². An important finding of this study is that the majority of patients and family members had two risk behaviors and approximately 20% of family members and one-third of patients had 3 risk behaviors. This level of risk behaviors is similar to population-based studies^{53,54} and highlights the need for future studies that focus on multiple risk reduction among lung cancer patients and their family members.

None of the patients and only one (3%) family member in this study met all four recommendations (no smoking, 5 fruits and vegetables a day, exercise for 30 minutes a day on 5 days a week, moderate use of alcohol) for life-style behaviors. Patients and their family members in our study were somewhat less likely to meet **healthy** life-style recommendations as compared to one other study that assessed adherence to lifestyle recommendations among a heterogeneous group of cancer survivors²³. Blanchard and colleagues²³ found that 5% of cancer survivors met all healthy life style recommendations. This finding could be related to the fact that smokers tend to have multiple risk behaviors as

compared to former smokers and never smokers^{13,55–57}. Given that this is the first study assessing multiple risk behaviors among smokers and recent quitters with lung cancer and their family members, further studies are needed to corroborate these findings.

Concordance of diet, alcohol use and physical activity levels was higher as compared with concordance levels of smoking behaviors between lung cancer patients and their family members. Our concordance rates for smoking behaviors were similar to those found by Weaver and colleagues³⁰ who examined smoking concordance between lung cancer patients and their caregivers. Weaver and colleagues³⁰ identified that concordance of smoking behaviors between lung cancer patients and their family members was associated with mental health and caregiver burden. Lung cancer caregivers who smoked reported greater anxiety and marginally higher depression as compared to caregivers that did not smoke. A trend was noted toward greater depression and anxiety among caregivers who were in mismatched dyads (either the patient or caregiver smoked but the other did not) when compared to those in non-smoking dyads. Caregivers whose patient care recipient continued to smoke when caregivers did not smoke had the highest levels of perceived caregiver burden and financial strain due to caregiving. These findings highlight the importance of assessing smoking status within the dyad and identifying those who may be in need of supportive care services, including support for cessation.

Concordance of behaviors between patients and their family members was highest for poor diet and physical inactivity suggesting that these two behaviors may be appropriate targets for intervention. It is well known that poor diet, physical inactivity, being overweight in combination with smoking are associated with multiple comorbidities including cardiovascular disease, pulmonary disease, osteoarthritis, type II diabetes and certain types of cancers. In fact, hypertension, osteoarthritis and asthma were the most common comorbidities within this sample of lung cancer patients and their family members. Thus, targeting the family unit after the diagnosis of cancer may offer a unique opportunity to decrease future risk of disease, promote health-related quality of life and enhance survival among a high risk group.

There is growing evidence that lower levels of physical activity and a diet that lacks adequate intake of fruits and vegetables are risk factors for developing lung cancer and that increased physical activity may decrease mortality after the diagnosis^{58–62}. The majority of studies suggest that physical activity reduces lung cancer risk by 20–30% for women and 20–50% for men and there is evidence of a dose-response relationship⁵⁸. Alfano and colleagues⁵⁹ identified that physical activity may even play a role in reducing cancer risk and mortality among those with significant tobacco exposure. Several studies have suggested that beta-carotene *ingested from foods* along with a diet rich in fruits and vegetables has a protective role against developing lung cancer⁶⁰. Ingestion of cruciferous vegetables seems to be particularly important in protection against lung cancer even among smokers⁶². Lam and colleagues⁶¹ identified that the risk for lung cancer was 22% lower in case control studies and 17% lower in cohort studies among those with the highest levels of total cruciferous vegetable intake as compared to those in the lowest category of total cruciferous vegetable intake.

This is the first study to examine motivational readiness to change multiple health behaviors among lung cancer patients and their family members. Despite the fact that many of the patients and their family members had multiple risk behaviors, it was encouraging to note that the levels of motivational readiness to change health behaviors among patient and family members in this study were the same and in many cases higher as compared to cancer survivors with other types of cancer^{23,43}. Similarly, interest in participating in health promotion programs was high. Patients and family members indicated an interest in having a multi-component program that addressed multiple risk behaviors. Patients and their family members appeared to be most interested in a program that integrated exercise, diet and stress management. There is beginning evidence that integrating stress management training into multiple risk factor reduction programs for cardiac and diabetic patients have been efficacious and have been associated with improved clinical outcomes^{63–65}.

The majority of behavioral studies conducted to date within lung cancer have examined isolated lifestyle behaviors rather than focusing on multiple risk reduction. Programs that have focused solely on smoking cessation have met with limited success and use of evidence-based treatment for smoking cessation has had low uptake among smokers with cancer⁶⁶. Beginning evidence supports the role of other lifestyle behavior changes, such as physical activity and improving one's diet, as a potential gateway to facilitate smoking cessation⁵⁵. Regular exercise added to a traditional smoking cessation program, "commit to quit", increased cessation rates as compared to the cessation program alone among female smokers⁶⁷. In another study, Harley and colleagues⁹ examined the effects of a cancer prevention intervention, Tools for Health, in blue collar construction workers that focused on promoting smoking cessation and increasing fruit and vegetables consumption. Results from this intervention demonstrated that workers in the intervention group experienced substantial levels of smoking cessation and increased their consumption of fruits and vegetables concurrently during the course of the study.

Both early and later stage lung cancer patients and family members were interested in health promotion programs within this sample. Two recent systematic reviews examined the role of exercise in the care of patients with lung cancer across the illness trajectory and the results were promising for the use of exercise as an adjunct treatment among patients with both early and advanced stages of illness^{68,69}. One study examined the use of exercise in combination with relaxation for patients with advanced lung cancer using a hospital based supervised group exercise along with a concurrent home based exercise program⁷⁰. Results from this study demonstrated an adherence rate of 76% for a hospital based, supervised group exercise, whereas the patients failed to adhere to the home-based exercise. Upon further exploration through patient interviews, the authors concluded that home-based training may be questionable in this group of patients due to patients' former sedentary lifestyle, advanced stage of disease and symptom burden. Home based exercise interventions have been useful in other groups of patients. Pinto and colleagues⁷¹ examined exercise adherence rates in a randomized controlled trial of a 12 week home based exercise trial among breast cancer patients. Results from this study found an adherence rate of 79.94% for weeks 5–12, which compared favorably to previous studies that examined home-based exercise adherence⁷². Pinto and colleagues⁷¹ noted that adherence rates were highest in the first few weeks of the intervention and then gradually decreased over time. The use of health

promotion interventions in lung cancer patients is in the very early phase of development. Thus, further studies are needed to identify the best approach toward integrating multiple behavioral risk factor reduction interventions among patients with lung cancer and their family members. It is likely that the type and format for these programs will differ depending on stage of the illness and the relationship between patient and family members but further studies are needed to inform intervention development.

There were several limitations of the study that must be considered when interpreting the results, which include a small sample size, narrow inclusion criteria, use of self-report data for smoking and weight, and use of quantitative data collection only. Our sample size was relatively small but was within the recommended sample size of 10 to 40 per group for pilot studies⁷³. This study was designed as a pilot study to examine descriptive data related to multiple health behaviors among lung cancer patients and their family members and to understand any potential issues with recruitment that can be used to guide the future development of health promotion programs. We discovered that our inclusion criteria were too narrow and as a result a significant number of participants (over 50%) were excluded primarily due to their smoking status. Future studies should broaden inclusion criteria and include all patients with lung cancer and family members to further ascertain risk behaviors, interest and preferences for the type and format for health promotion programs. Another potential limitation is the use of self-reported data for smoking status and weight. Self-reported assessments used to measure lifestyle behaviors are inferior to objective measures⁷⁴. Future studies should incorporate objective measures especially within the context of intervention trials designed to decrease multiple risk behaviors. Another important avenue for future research is to include qualitative research methods which would allow researchers to ascertain beliefs and perceptions of patients and their family members about multiple risk reduction behavioral programs in order to develop more appropriate and effective intervention strategies. One potential strategy is the use of focus groups as this approach is appropriate when the investigator is interested in understanding complex behavior, attitudes and motivations that underlie these behaviors. This approach is especially useful when one is interested in developing complex interventions to improve health^{75,76}.

In summary, our findings indicated that the majority of lung cancer patients and their family members in this study had two risk behaviors and approximately 20% of family members and one-third of patients had 3 risk behaviors. This level of risk behaviors highlights the need for future studies that focus on multiple risk reduction studies among lung cancer patients and their family members. There were high levels of interest for multiple risk factor reduction interventions especially geared toward improved diet, physical activity and stress management.

Addressing health promotion within the context of the family unit may provide an innovative approach to improve health-related quality of life and decrease risk for cancer and other chronic illnesses among family members as well as improve physical, functional and psychological outcomes and decrease recurrence and lengthen survival among patients. The results of this study provide essential information to guide further development and testing of health promotion interventions that meet the needs of patients with lung cancer and their family members.

A focus on health promotion is an important part of comprehensive care provided to patients with lung cancer and their family members. The results from this study provide beginning evidence that patients with lung cancer and their family members experience multiple risk behaviors after the diagnosis of cancer and are interested in health promotion programs. Oncology nurses are in a unique position to provide leadership in assessing health behaviors and implementing evidence-based interventions such as initiating a walking program, dietary counseling to increase physical activity, consumption of fresh fruits and vegetables, smoking cessation that have the potential to greatly enhance clinical outcomes after the diagnosis of lung cancer.

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Figure 1.
Behavioral Risk Factors in Lung Cancer Patients and their Family Members

Figure 2.
Interest in Target Risk Behaviors for Health promotion among Patient-Family Member Dyads

Table 1

Demographic Characteristics of the Lung Cancer Patient-Family Member Dyads (n=37 dyads)

Patients'		Family members
Age	59 (45–76)	49 (18–65)
(Median and range in years)		
<i>Time since diagnosis Mean= 177.62 (days)</i>		
<i>SD=131.18 (days)</i>		
Characteristic N (%)		Characteristic N (%)
Gender		
Male	20 (54%)	11 (30%)
Female	17 (46%)	26 (70%)
Race		
White	32 (86%)	33 (89%)
Black	5 (14%)	4 (11%)
Education		
<= HS	18 (49%)	9 (24%)
>HS	19 (51%)	28 (76%)
Marital		
Single	15 (41%)	12 (32%)
Married	22 (59%)	25 (68%)
Work		
Retired or Unemployed	14 (38%)	6 (16%)
Part-time	3 (8%)	6 (16%)
Full-time	10 (27%)	18 (49%)
Other	8 (22%)	5 (14%)
Missing	2(5%)	2(5%)
Relation		
Spouse		17 (46%)
Partner		4 (11%)
Adult child		16 (43%)

Table 2

Type of Health Promotion Program Component Preferred by Patient-Family Member Dyads

	Patient		Family	
	N	%	N	%
Mailed brochure				
No	22	59	19	51
Yes	15	41	18	49
One on One Counseling				
No	24	65	19	51
Yes	13	35	18	49
Group Format				
No	25	68	22	59
Yes	12	32	15	41
Videotapes				
No	28	76	24	65
Yes	9	24	13	35
Internet				
No	28	76	25	68
Yes	9	24	12	32
Home based				
No	29	78	27	73
Yes	8	22	10	27
Telephone Counseling				
No	30	81	28	76
Yes	7	19	9	24
Cell phone				
No	33	89	33	89
Yes	4	11	4	11
Not interested				
No	31	84	33	89
Yes	6	16	4	11

Table 3

Concordance of Health Behaviors among Lung Cancer Patient-Family Member Dyads

Health Behavior	Agreement		
	N	%	90% CI
Smoke (N=37)			
Both smoke	8	22	11–36
Patient only smoke	8	22	11–36
Family only smoke	3	8	2–20
Neither smoke	18	49	34–63
Diet (N=37)			
Patient only meet 5 a day	3	8	2–20
Family only meet 5 a day	2	5	1–16
Neither meet 5 a day	32	86	74–95
Alcohol Use (N=32)			
Both use alcohol	3	9	3–22
Patient only use alcohol	2	6	1–18
Family only use alcohol	3	9	3–23
Neither use alcohol	24	75	59–87
Physical Activity (N=37)			
Both exercise	2	5	1–18
Patient only exercise	4	11	4–23
Family only exercise	4	11	4–23
Neither exercise	27	73	58–85