Health behaviors of early-stage non-small cell lung cancer survivors

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Abstract

Introduction Lung cancer survivors are at risk for cancer recurrence and other chronic illnesses related predominantly to prior tobacco use and older age. Optimal quality of post-treatment care requires greater knowledge of survivors' adherence to behavioral health recommendations. This study reports the rates of smoking, physical activity, alcohol use, cancer screenings, and routine primary care visits in non-small cell lung cancer (NSCLC) survivors.

Methods Stage IA and IB NSCLC survivors ($N=183$, mean age=69.0 years) with no evidence of disease 1–6 years post-treatment completed standard survey items regarding health and cancer screening behaviors.

Results Most survivors (83.5%) had a history of smoking, but 64.8% quit prior to diagnosis and only 5.5% continued to smoke. Alcohol intake recommendations were exceeded by 5.4% and 17.3% of men and women, respectively. In a typical week, 23.1% met physical activity guidelines. Regarding cancer screenings, 89.3% were adherent to colorectal cancer screening guidelines. Among women, 72.0% had a mammogram within the previous year and 81.5% had a pap test in the previous 3 years; among men, 86.7% had a prostate-specific antigen test in the previous year. Almost all (97.3%) had seen a primary care provider in the past year.

Discussions/conclusions The majority of lung cancer survivors were adherent to health promotion recommendations, but few engaged in the recommended level of physical activity.

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Implications for cancer survivors Physical and pulmonary rehabilitation interventions may help lung cancer survivors maintain sufficient levels of physical activity, which can have numerous benefits for older adults.

Keywords Health behavior · Cancer screening · Survivorship · Lung cancer

Introduction

Survivors of lung cancer are a growing yet understudied population. With medical care during cancer survivorship increasingly being shared between oncology and primary care providers, greater understanding of the unique preventive health needs of these survivors is needed. Of the estimated 222,520 individuals who were diagnosed with lung cancer in the USA in 2010 [1], 15% will become at least 5-year survivors of the disease [2]. If diagnosed and treated in stages IA and IB, however, 5-year survival increases to 67% and 57%, respectively [3]. Compared with survivors of other cancers, lung cancer survivors tend to be older and suffer from both treatment-related symptoms and tobacco-related comorbidities. Adherence to behavioral health recommendations is an important goal for addressing modifiable risk factors for poor health outcomes and optimizing post-treatment quality of care for lung cancer survivors.

Lung cancer survivors up to 5 years post-diagnosis have the lowest functional status compared with survivors of other cancers [4]. Fatigue, pain, dyspnea, and impaired quality of life [5–8] are particularly common treatment sequelae that limit functional ability in these survivors [9, 10]. They are at risk for recurrence and second primary cancers [11, 12], and 90% of lung cancer survivors have a history of tobacco use, increasing the likelihood of medical problems related to tobacco exposure. For instance, cervical, bladder, kidney, colorectal, and breast cancers, as well as coronary artery disease, are associated with a history of tobacco use and older age, characteristics common to this survivorship population [13, 14]. Therefore, routine cancer screening and preventive care represent important post-treatment quality of care endpoints for these survivors.

Adherence to behavioral health recommendations (e.g., smoking abstinence, increasing physical activity, and regular cancer screenings) may improve a variety of outcomes in lung cancer survivors. Smoking cessation after lung resection has been associated with improved performance status and increased survival [15, 16], yet an estimated 13–60% of lung cancer survivors continue to smoke following diagnosis and treatment [17] even though it can exacerbate fatigue and increase the risk of recurrence

and second primary cancers [18, 19]. Excess alcohol consumption can lead to colorectal, liver, lung, and upper aerodigestive tract cancers, especially when combined with tobacco use [20–22]. Regular physical activity may benefit cancer survivors by mitigating treatment disease- and treatment-related sequelae and the effects of comorbid conditions such as cardiovascular disease and diabetes [23]. Studies among patients and survivors of a variety of cancers have indicated associations between physical activity and improvements in functional well-being, vitality, cardiorespiratory fitness, depression, anxiety, and fatigue [24–26].

While some studies have examined behavioral health practices in cancer survivors [27–30], only Evangelista et al. [17] and Coups et al. [31] specifically surveyed lung cancer survivors. These studies established a foundation for examining health behaviors in lung cancer survivors; however, Evangelista et al. only examined survivors who were >5 years post-treatment and Coups et al. focused solely on physical activity outcomes. In addition, these studies did not examine cancer screening behaviors, an important quality-of-care criterion especially given survivors' increased risk for secondary cancers and lapses in screening that have been reported [32, 33].

The goal of the present study was to examine health-related behaviors of early-stage lung cancer survivors who had undergone curative surgical resection as their primary treatment and remained disease-free during the follow-up period. Primary outcomes were frequencies of smoking, alcohol use, physical activity, and adherence to routine primary care visits and recommended cancer screenings.

Method

Participants and procedure

Patients were identified from queries of institutional clinical and research databases at Memorial Sloan-Kettering Cancer Center (MSKCC). Initial eligibility criteria confirmed by chart review were: diagnosis of primary stage IA or IB NSCLC, surgical resection with curative intent, between 1 and 6 years post-surgical treatment, and no evidence of disease at time of recruitment. Secondary criteria were: reachable by phone, no cognitive impairment likely to interfere with study participation (as defined by less than four errors on the Brief Six-Item Screener [34]), and ability to give informed consent. Stage IA and IB survivors were selected because their greater likelihood of disease-free survival enables the assessment of behavioral risk factors independent of those related to active cancer treatment.

After being evaluated for initial eligibility criteria, all potential participants ($n=503$) were mailed a consent form and letter inviting study participation. Two weeks later, they received a telephone call to assess secondary eligibility and interest in the study. After providing consent, they had the option of completing the 45- to 60-min survey via phone or mail. All individuals contacted about the study were offered information regarding MSKCC's Post-Treatment Resource Program and the National Cancer Institute brochure entitled, "Facing Forward: Life after Cancer Treatment." Study procedures were approved by the hospital's Institutional Review Board.

Measures

Demographic and health behavior variables

Participants reported their age, sex, race/ethnicity, education, marital/partnership status, employment status, and income. Insurance status was abstracted from the institutional database. Assessment of health behaviors included standard questions about tobacco and alcohol use quantity and frequency, routine primary medical care (annual physical exams), and cancer screening behaviors (fecal occult blood test, sigmoidoscopy, colonoscopy, Papanicolaou test, mammography, and prostate-specific antigen tests) using items from the Behavioral Risk Factor Surveillance Survey [35], the National Health Interview Survey [36], and the Health Information National Trends Survey [37]. Survivors reported average weekly physical activity using an adapted version of the Godin Leisure-Time Exercise Questionnaire [38].

Medical variables

The thoracic surgical database was used to identify survivors' pathological disease stage, time since surgical resection, type of surgical resection, and presence of comorbid pulmonary and cardiovascular conditions.

Analytic plan

Frequencies, means, and standard deviations were calculated using SAS, version 9.2 [39], to examine characteristics of the selected health and cancer screening behaviors. The behaviors measured were: smoking status; quantity and frequency of average weekly alcohol intake; average minutes per week of mild, moderate, and strenuous physical activity; date of last routine primary care visit; colorectal cancer screening (i.e., fecal occult blood test (FOBT), colonoscopy, sigmoidoscopy); Papanicolaou test; mammography screening (for women); and prostate-specific antigen (PSA) testing (for men). We used logistic

regression analyses to examine the relationship among health behaviors and select covariates: age, sex, education (high school or higher), any cardiovascular condition, any pulmonary condition, time from surgery, and insurance status (private/Medicare vs. none/Medicaid).

Dichotomous variables indicating adherence (yes/no) were created for each health behavior based on the American Cancer Society [40] and US Preventive Services Task Force [41] recommendations in place at the time of the survey (2005–2007). Adherence to recommendations was defined as: complete abstinence from tobacco, consuming fewer than 15 alcoholic drinks/week for men and 8 for women, engaging in at least 150 min per week of moderate to strenuous physical activity [42], engaging in any physical activity, mammography within the past year for women over 40, Papanicolaou test within the past 3 years for women over 30, and PSA test within past year for men over 40. Colorectal screening adherence was defined as either FOBT within the past year, sigmoidoscopy within the past 5 years, or colonoscopy within the past 10 years for those 50–75 years old [41]. Participants were also asked whether they had received routine primary medical care (physical exam) in the past year (yes/no).

Results

Participants

NSCLC patients ($n=503$) were identified from the thoracic surgery and institutional research databases, of which 222 were screened out due to the following ineligibility criteria: current evidence of cancer ($n=71$), being more than 6 years post-surgical resection ($n=46$), deceased ($n=26$), diagnosis of pathological stage II–IV disease ($n=25$), or low English fluency ($n=17$). A total of 19 patients could not be contacted via phone and 78 declined to participate primarily due to lack of study interest ($n=23$), wishing to avoid discussion of lung cancer ($n=20$), and not feeling well enough to participate ($n=10$). We obtained data from a total of 183 lung cancer survivors (65% of eligibles) from September 2005 through July 2007. Those who completed the survey did not differ from those who refused participation by mean age, sex, time since surgical resection, or pathological disease stage ($p>0.05$).

Demographics and medical characteristics

Demographic and medical characteristics of the sample are presented in Table 1. The mean age of participants was 69.0 (SD=9.9, range=40–91) years and 63.9% were female. Survivors' mean time since surgical resection was 2.9 (SD=1.2) years. Most (73.1%) of the sample had undergone

Table 1 Demographic and medical characteristics of sample ($N=183$)

Characteristic	<i>n</i>	Percentage
Age (years) ($M=69.0$, $SD=9.9$)		
35–54	19	10.4
55–64	33	18.0
65–74	73	39.9
75+	58	31.7
Sex (female)	117	63.9
Married/partnered	112	61.2
Race/ethnicity		
Non-Hispanic white	171	93.4
Non-Hispanic black	5	2.7
Non-Hispanic other	1	0.6
Hispanic	6	3.3
Employment status		
Employed	49	26.8
Homemaker	14	7.6
Unemployed	3	1.6
Retired	111	60.7
Unable to work	6	3.3
Education		
≤High school	64	35.0
Some college	33	18.0
College graduate	47	25.7
Graduate degree	39	21.3
Income (US \$)		
10–29 k	30	20.0
30–49 k	28	18.7
50–69 k	23	15.3
70–89 k	11	7.3
90 k+	58	38.7
Missing (<i>n</i>)	(33)	
Insurance status		
Private insurance	52	28.4
Medicare	3	1.6
Medicaid	122	66.7
No insurance	6	3.3
Pathological disease stage		
IA	125	68.3
IB	58	31.7
Time since surgical resection (years) ($M=2.9$, $SD=1.2$)		
1 to <2	23	12.6
2 to <3	54	29.5
3 to <4	48	26.2
4 to <5	41	22.4
5 to <6	17	9.3
Type of surgical resection		
Wedge	26	14.3
Segmentectomy	17	9.3
Lobectomy	133	73.1

Table 1 (continued)

Characteristic	<i>n</i>	Percentage
Bilobectomy	4	2.2
Pneumonectomy	2	1.1
Pulmonary comorbidities		
Chronic obstructive pulmonary disease (COPD)	45	24.8
Asthma	11	6.1
Tuberculosis	1	0.5
None	124	68.6
Missing (<i>n</i>)	(3)	
Cardiac comorbidities		
Afibrillation	5	2.8
Coronary artery bypass	7	3.9
Hypertension	39	21.5
Heart Attack	7	3.9
Other	18	9.9
None	105	58.0
Missing (<i>n</i>)	(2)	
Body mass index (BMI)		
Underweight	3	1.6
Normal	73	39.9
Overweight	62	33.9
Obese	45	24.6

lobectomy, with wedge resection being the second most common surgical procedure (14.3%).

Health behaviors and adherence to recommendations

With regard to health behaviors (see Table 2), 5.5% identified as current smokers at the time of the survey, with 16.5% reporting no history of tobacco use. Among those with a prior history of smoking, 77.6% quit prior to and 15.7% quit after their surgical resection. Since diagnosis, 85% of current and former smokers reported that they had received advice to quit by their healthcare provider. In terms of alcohol intake, 42% of women and 38% of men reported that they did not use alcohol. Among men, 5.4% typically consumed 15 or more drinks/week; 17.3% of women consumed eight or more drinks/week. Approximately half (46.6%) engaged in any moderate or strenuous physical activity, averaging 86.0 min ($SD=141.1$) each week, but 76.9% did not meet the current recommendation of at least 150 min/week. One quarter (24.7%) indicated complete absence of regular physical activity. Almost all participants (97.3%) reported having a routine physical exam with a primary care provider in the past year.

Adherence to cancer screenings was moderate to high (see Table 3). Among survivors between the ages of 50 and 75, 89.3% were adherent to colorectal cancer screening. For

Table 2 Rates of adherence to health behaviors ($N=183$)

Behavior	<i>n</i>	Percentage
Smoking status		
Current smoker	10	5.5
Quit prior to resection	118	64.8
Quit after resection	24	13.2
Never smoker	30	16.5
Missing (<i>n</i>)	(1)	
Received provider advice to quit since diagnosis ^a	45	85.0
Missing (<i>n</i>)	(2)	
Alcohol intake quantity/frequency (drinks/week)		
Males		
None (abstain)	21	38.2
>14	3	5.4
Missing (<i>n</i>)	(11)	
Females		
None (abstain)	34	42.0
>7	14	17.3
Missing (<i>n</i>)	(36)	
Physical activity (average minutes/week)		
Any mild (93.1, SD=128.5)	118	64.8
Any moderate/strenuous (86.0, SD=141.1)	83	46.6
≥150 min/week moderate/strenuous	42	23.1
None	45	24.7
Missing (<i>n</i>)	(1)	
Primary care visit in past year	177	97.3
Missing (<i>n</i>)	(1)	

^a For current smokers at time of diagnosis only

women older than 40, 72.0% had received a mammogram and 81.5% had received a Papanicolaou test in the past 3 years (using a less stringent time criterion [43], 84.3% had received a mammogram in the past 2 years). For men over 40, 86.7% had a PSA test within the past year. The results of the multivariate logistic regression analyses are shown in Table 4. Decreased adherence to physical activity guidelines was related to having a cardiovascular diagnosis ($p<0.01$) as well as a longer time since surgery ($p=0.05$). Receiving recommended Papanicolaou screening was related to having private insurance or Medicare ($p<0.01$), and for men having a PSA test was related to older age ($p=.03$) and not having a pulmonary condition ($p=0.03$). There were no significant associations with colorectal cancer screening.

Discussion

Many NSCLC survivors in the present sample were engaging in health-protective behaviors and receiving

Table 3 Rates of adherence to cancer screenings ($N=183$)

Screening	<i>n</i>	Percentage
Mammogram (women ≥40 years)		
Ever had	114	98.3
Within past year	82	72.0
>1 to 2 years	14	12.3
>2 to 4 years	12	10.5
5+years ago	6	5.3
Missing (<i>n</i>)	(3)	
Papanicolaou test (women ≥30 years)		
Ever had	109	94.0
Within past year	60	55.6
>1 to 3 years	28	25.9
Within past 4 years	13	12.0
5+years ago	5	4.6
Unsure/don't know ^a	2	1.9
Missing (<i>n</i>)	(9)	
PSA test (men ≥40 years)		
Ever had	60	90.9
Within past year	52	86.7
>1 to 4 years	6	10.0
5+years ago	1	1.7
Unsure/don't know ^a	1	1.7
Missing (<i>n</i>)	(6)	
Adherent to any colorectal screening recommendation (among 50–75 year olds)	100	89.3
Missing (<i>n</i>)	(12)	

PSA prostate-specific antigen

^a Participants reported having had a particular screening, but could not identify a particular timeframe

routine cancer screenings. In terms of health behaviors, fewer survivors reported current smoking compared with previous studies (5.5% vs. 13.4%, $p<0.05$) [17], a finding that may be due to the availability of an intensive tobacco cessation program at our institution. The overall rate of alcohol consumption observed in the present sample mirrors that of other studies of lung cancer survivors [17]. However, while few (5.4%) men consumed more than the weekly recommended alcohol intake, over 17% of women did. Since heavy drinking heightens the risk for cancers of the head and neck [22], women may need additional education from healthcare providers regarding cancer risks associated with heavy alcohol use as well as a recommendation that they limit their alcohol intake to one drink per day. While 23.1% were engaging in at least moderate/strenuous levels of physical activity for 150 min or more per week, this rate is less than the national average of 31% ($p<0.05$) [44], and almost a quarter of the sample was not physically active at any level, suggesting a particular lack

Table 4 Multivariate correlates of health behavior and cancer screening adherence

Outcome	Age OR (95% CI)	Sex (vs. male) OR (95% CI)	≥High school education OR (95% CI)	Cardiac condition OR (95% CI)	Pulmonary condition OR (95% CI)	Time since surgery OR (95% CI)	Insurance (private or Medicare vs. none or Medicaid) OR (95% CI)
Low alcohol intake	0.99 (0.94–1.05)	3.30 (0.86–12.67)	0.84 (0.26–2.69)	1.42 (0.44–4.57)	1.97 (0.51–7.51)	0.75 (0.49–1.14)	NA
Meet physical activity guidelines	0.97 (0.94–1.01)	0.60 (0.27–1.29)	1.11 (0.51–2.41)	0.30 (0.13–0.69)	1.99 (0.94–4.23)	0.72 (0.51–1.00)	NA
Mammography screening	0.98 (0.93–1.03)	NA	0.66 (0.25–1.73)	1.06 (0.43–2.62)	2.18 (0.78–6.10)	0.91 (0.64–1.29)	3.76 (0.61–23.00)
Pap screening	0.94 (0.88–1.01)	NA	2.33 (0.76–7.18)	0.55 (0.18–1.62)	1.37 (0.42–4.48)	0.86 (0.56–1.31)	34.13 (3.18–366.29)
PSA screening	1.15 (1.01–1.31)	NA	5.67 (0.69–46.74)	0.10 (0.01–1.23)	0.09 (0.01–0.82)	2.23 (0.84–5.92)	0.01 (0.01–999.99)
Colorectal cancer screening	0.99 (0.90–1.09)	2.37 (0.67–8.41)	0.83 (0.22–3.10)	1.55 (0.40–5.98)	1.11 (0.29–4.25)	1.04 (0.62–1.77)	2.59 (0.21–32.15)

Statistically significant associations are shown in bold
PSA prostate-specific antigen

of physical activity among these survivors. Having a cardiovascular condition was negatively associated with physical activity in the multivariate analysis. This finding, combined with the fact that over 40% of the sample had a comorbid cardiovascular condition, may help explain the low rate of physical activity among these survivors. We are currently conducting a trial to examine methods for increasing physical activity among sedentary lung cancer survivors.

The rates of screenings observed here tended to be higher than in the general population for colorectal (89.3% vs. 60.8%) [45], mammography (84.3% vs. 76.5% [46] in the past 2 years), and PSA testing (86.7% vs. 53%) [47], whereas rates for cervical cancer screening were similar to other samples (81.5% vs. 85%) [48]. Cervical cancer screening was strongly related to insurance status, suggesting access as a significant barrier to adherence. Controlling for age, men with a pulmonary condition were less likely to receive a PSA screening, possibly indicating less focus on routine screenings in light of other symptoms. Physical activity declined as time from surgery increased, providing support for increased emphasis on maintaining health behaviors in survivorship.

Study strengths and limitations

Strengths of the study include its focus on an understudied cancer survivorship population, use of standardized items for assessing health behaviors, and a good response rate (65%) along with a lack of response bias on key indicators. Limitations involve the self-report nature of estimates of health behaviors and the generalizability of findings, given that the sample was relatively well-educated and lacked racial/ethnic diversity. Unfortunately, minorities, those with less education, and persons who lack health insurance are typically diagnosed at later stages [49] and are less likely to be present in a survivorship sample. We therefore included education and insurance status in our multivariate analysis to examine the effects of these demographic variables on health behaviors. The cross-sectional research design prohibits examination of temporal patterns and stability of adherence to health behavior recommendations.

Conclusions

This study indicates that lung cancer survivors in the present sample were adherent to most preventive health recommendations. With most lung cancer survivors being over the age of 60 [49] and with 70% of those 60 and older suffering from cardiovascular disease [44, 50], clinical focus should continue to include both cancer surveillance

and reduction of health risk behaviors, such as physical inactivity, that are closely linked to chronic diseases [51, 52]. Physical therapy and pulmonary rehabilitation interventions may help lung cancer survivors maintain sufficient levels of physical activity, which can have numerous benefits for older adults. Healthcare providers should continue to counsel patients throughout survivorship and use brief behavioral interventions, such as the 5A's brief counseling model [53, 54], to promote adherence to preventive health behavior changes recommended as part of survivorship care plans [55].

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