

Opinions and Practices of Lung Cancer Screening by Physician Specialty

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BACKGROUND In response to the National Lung Screening Trial, numerous professional organizations published guidelines recommending annual lung cancer screening with low-dose computed tomography (LDCT) for high-risk patients. Prior studies found that physician attitudes and knowledge about lung cancer screening directly impacts the number of screening exams ordered.

METHODS In 2015, we surveyed 34 pulmonologists and 186 primary care providers (PCPs) to evaluate opinions and practices of lung cancer screening in a large academic medical center. We compared PCP and pulmonologist responses using t-tests and χ^2 tests.

RESULTS The overall survey response rate was 40% (39% for PCPs and 50% for pulmonologists). Pulmonologists were more likely than PCPs to report lung cancer screening as beneficial for patients (88.2% versus 37.7%, $P < .0001$) and as being cost-effective (47.1% versus 14.3%, $P = .02$). More pulmonologists (76%) reported ordering a LDCT for screening in the past 12 months compared to PCPs (41%, $P = .012$). Pulmonologists and PCPs reported similar barriers to referring patients for lung cancer screening, including patient costs (82.4% versus 77.8%), potential for emotional harm (58.8% versus 58.3%), high false positive rate (47.1% versus 69.4%), and likelihood for medical complications (47.1% versus 59.7%).

LIMITATIONS Our results are generalizable to academic medical centers and responses may be susceptible to recall bias, non-response bias, and social desirability bias.

CONCLUSION We found significant differences in opinions and practices between PCPs and pulmonologists regarding lung cancer screening referrals and perceived benefits. As lung cancer screening continues to emerge in clinical practice, it is important to understand these differences across provider specialty to ensure screening is implemented and offered to patients appropriately.

In 2017, an estimated 222,500 new cases of lung cancer were diagnosed and more than 155,800 people died from lung cancer [1]. In 2011, the National Lung Screening Trial (NLST) found a 20% reduction in lung cancer mortality when high-risk patients, defined as those aged 55–74 years who were current or former (quit within the past 15 years) smokers with a 30 pack-year smoking history, were screened annually with low-dose computed tomography (LDCT) as compared to chest radiography [2]. This mortality benefit led to a Grade B endorsement for lung cancer screening with LDCT by the US Preventive Services Task Force (USPSTF) in December of 2013 [3]. Recommendations for lung cancer screening vary among professional societies with respect to their criteria for identifying high-risk patients based on age and smoking status, but it is widely accepted to screen patients who meet the NLST criteria. The National Comprehensive Cancer Network (NCCN) [4], the American Lung Association (ALA) [5], the American Cancer Society (ACS) [6], the American Thoracic Society (ATS) [7], the American Society of Clinical Oncologists (ASCO) [8], and the American College of Chest Physicians (ACCP) [7] recommend that individuals at high risk for lung cancer consider annual screening with LDCT. In contrast, the American Academy of Family Physicians (AAFP) states that there is insufficient evidence to recommend for or against screening for lung cancer with LDCT [9]. Since January 2015, private insurance payers have covered lung cancer screening and

in February 2015, the Centers for Medicare and Medicaid Services (CMS) began providing reimbursement for lung cancer screening in high-risk individuals [6, 5, 10]. Under the USPSTF guidelines, an estimated 8.7 million US adults fit within the screening-eligible population [11].

Prior research has found that physician attitudes, beliefs, and knowledge about lung cancer screening directly impact the number of reported screening exams ordered [12–14]. Barriers to screening commonly cited by physicians include uncertainty of patient benefits, patient financial burdens, and concern regarding potential harms [15–18]. Although lung cancer screening attitudes, beliefs, and knowledge have been examined among primary care providers (PCPs) and specialists, no studies to date have compared physician opinions and practices by specialty in the same medical center. Evaluating differences by specialty will allow us to identify the extent to which our lung cancer screening program is being implemented equally across the health care system and points for further education and communication among

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physicians. Therefore, we sought to understand the practices and attitudes of pulmonologists and PCPs in a large academic medical center.

Materials and Methods

Survey Development

Using the Tailored Design Method, we conducted a web-based survey (using Qualtrics survey software) of physicians in Family Medicine, Internal Medicine, and Pulmonology in 2015 [19]. The Tailored Design Method is an approach to designing surveys that emphasizes all aspects of questionnaire and survey implementation procedures and focuses on reducing 4 dominant sources of survey error: sampling, coverage, measurement, and nonresponse. Survey questions were developed through collaboration with a multidisciplinary Advisory Group, which included 7 members from the following fields of study: Internal Medicine, Family Medicine, Thoracic Radiology, Pulmonary Medicine, Pathology, Survey Methodology, and Epidemiology. Over the course of 6 conference calls and follow-up correspondence, we discussed survey themes, developed specific questions, and revised our survey instrument. We included 23 survey items focused on opinions about lung cancer screening, lung cancer screening practices, perceived barriers to lung cancer screening, and physician demographics. Survey questions were comprised of Likert scale items, clinical vignettes, and multiple choice. The survey was pre-tested with 5 North Carolina physicians in primary care or pulmonology who practice outside of the participating academic center. These physicians provided feedback with regard to survey flow, length, design, and ease of understanding and responding to the survey questions. Responses from the pre-testing led to modifications to clarify the intent of several questions. The survey was conducted after the USPSTF guideline was issued. During the time of this survey, lung cancer screening had been adopted at our institution by some providers and clinics. Preliminary data indicated that lung cancer screening was fragmented, and few patients were being screened. The survey was designed to help further understand physicians' behaviors and screening patterns.

Physician lung cancer screening opinions were evaluated via a 5-point Likert scale that ranged from strongly agree to strongly disagree. The survey asked physicians to rank their opinion on 6 statements: 1) I am convinced that screening for lung cancer is beneficial for patients; 2) inconsistent recommendations about lung cancer screening make it difficult to decide whether or not to screen; 3) screening for lung cancer is cost-effective; 4) I rely on the recommendations of local specialists regarding lung cancer screening in my practice; 5) I have enough knowledge to explain the pros and cons of lung cancer screening to my patients; and 6) time restrictions during a patient's clinic visit mean other conditions have higher priority over screening for lung cancer.

Physician lung cancer screening practices were assessed through 5 clinical vignettes of hypothetical patient sce-

narios to assess knowledge of screening guidelines and to show the complexities involved in making screening decisions. Vignette 1 consisted of a healthy 60-year-old former smoker with a 30 pack-year history who quit smoking 1 year ago. Vignette 2 included a healthy 55-year-old former smoker with a 15 pack-year history who quit smoking 20 years ago. Vignette 3 consisted of a healthy 62-year-old former smoker with a 40 pack-year history who quit smoking 16 years ago and was exposed to asbestos in the workplace. For each vignette, physicians were asked if they would or would not recommend lung cancer screening with LDCT, or if they would request additional information. Since differing organizations have varying recommendations for lung cancer screening (in terms of age at which to screen, smoking history, and other factors), there is no one correct answer for each vignette. For vignette 1, all organizations except the AAFP recommend screening. In vignette 2, the fact that the patient quit smoking 20 years ago indicates that they do not meet USPSTF, ALA, ACS, ATS, ASCO, or ACCP guidelines for screening, although they do meet the NCCN criteria. For vignette 3, the patient is outside the 15 year-since-quit window so does not meet most organizations' criteria for screening, but the patient has exposure to asbestos so may be suitable for screening if it were risk-based.

Additional survey questions included whether the physician had ordered a LDCT for lung cancer screening in the past 12 months, if they had initiated discussion regarding the risks and benefits of screening, if they had discussed the results of an LDCT screening exam with a patient, or if they had referred a patient for lung cancer screening. These questions were based on those from the 2006 National Cancer Institute Colorectal and Lung Cancer Screening Questionnaire [20]. Questions also included whether or not a physician had received requests from patients for lung cancer screening in the past 12 months, and if so, how many requested screening. Lastly, the survey included a question regarding patient referrals for a smoking cessation program.

In order to determine awareness of guidelines concerning lung cancer screening, physicians were given a list of professional organizations that have published statements concerning lung cancer screening and were asked if these organizations recommend for or against lung cancer screening.

To ascertain physician-perceived barriers to lung cancer screening, we provided a list related to test performance issues, patient-related issues, health care access issues, and medical complications. Physicians were asked to select all perceived barriers. Lastly, physician demographics included age, race, ethnicity, gender, medical division, the number of years in clinical practice, the percent of effort dedicated to patient care, and the number of patients typically seen in their clinic.

Survey Deployment

We identified physicians in Family Medicine, Internal

Medicine, and Pulmonary Medicine groups through our academic online directories. We mailed each participant a pre-notification postcard to introduce the study and survey. One week later, a survey link was emailed to each participant. At 1, 4, 8, and 9 weeks post-survey delivery, reminder emails were sent to those who had not yet responded. A reminder postcard was mailed 2 weeks after survey deployment. The survey was conducted online with responses recorded directly in Qualtrics at the time of survey completion, then exported for analysis in SAS v9.4 (SAS Institute, Inc., Cary, NC). Consent for the study was determined by return of the survey. As an incentive, those who participated were given the opportunity to enter into a random drawing for an iPad. We limited our survey to 23 items and included an incentive, as prior work has shown this to increase physician response rates [21-23]. This study was reviewed and approved by the University of North Carolina at Chapel Hill Institutional Review Board.

Statistical Analysis

We combined Family Medicine and Internal Medicine physicians into a PCP group, as the majority of patients eligible for screening will be identified from these 2 groups and both groups provide primary care. We compared PCP responses with physicians in Pulmonary Medicine using t-tests for continuous outcomes and χ^2 tests for categorical outcomes.

Results

The overall survey response rate was 40% and by physician group was 50% for pulmonologists (17 of 34) and 38.7% for PCPs (72 of 186). Within the PCP group, 37 were from Family Medicine and 35 were from Internal Medicine.

Approximately 58.3% of PCPs were attending physicians and 41.7% were resident physicians, whereas 64.7% of pulmonologists were attending physicians and 35.3% were resident physicians. The mean age of pulmonologists and PCPs was similar (see Table 1). Compared with PCPs, pulmonologists spent less time in outpatient care (mean time 45% versus 29%, respectively) and saw fewer patients per week. Physicians in Family Medicine and Internal Medicine were similar with respect to age, sex, race, years in clinical practice, percent of time spent in outpatient care, and the average number of patients seen per week.

The majority of respondents agreed that they had enough knowledge to explain the pros and cons of lung cancer screening to their patients. Most pulmonologists agreed that lung cancer screening is beneficial for patients, while most PCPs disagreed or were undecided ($P < .001$) (see Table 2). Pulmonologists were more likely to report screening as cost-effective ($P = .02$) and that they rely on recommendations of local specialists when making lung cancer screening decisions compared with PCPs ($P < .001$). It is important to note that within pulmonology there are screening specialists. PCPs were significantly more likely than pulmonologists to report that time restrictions during a patient's visit led to other presenting problems having higher priority than lung cancer screening ($P = .012$). Within the PCP group, Family Medicine and Internal Medicine physicians had similar answers except for the question "I have enough knowledge to explain the pros and cons of lung cancer screening to my patient," for which Family Medicine physicians were more likely to report being undecided than Internal Medicine (31% versus 3%).

The majority of pulmonologists and PCPs correctly identified that the USPSTF and the ACS recommend lung

TABLE 1.
Characteristics of Survey Respondents by Provider Specialty

	Pulmonologists N = 17		Primary care providers N = 72	
	N or Mean	% (Range)	N or Mean	% (Range)
Age, mean	40.8	(29-67)	39.7	(28-64)
# Missing	2		9	
Sex				
Female	5	31.3	34	53.1
Male	11	68.8	30	46.9
Missing	1	-	8	-
Race				
White	12	75.0	57	89.1
Non-white	4	25.0	7	10.9
Missing	1	-	8	-
Years in clinical practice, mean	13.4	(2-35)	11.0	(1-35)
# Missing	1		8	
% Time in outpatient care, mean	29.4	(10-70)	44.5	(5-100)
# Missing	1		7	
Average # patients seen in outpatient/week	16.7	(6-50)	28.0	(3-100)
# Missing	1		7	

cancer screening (see Table 3). However, a higher proportion of pulmonologists knew that the ACCP recommends screening compared with PCPs (76.5% versus 38.5%, respectively). Very few pulmonologists or PCPs knew that the AAFP does not endorse lung cancer screening. Among PCPs, Family Medicine and Internal Medicine physicians had similar responses except for the AAFP organization, for which Family Medicine physicians were more likely to report

yes than Internal Medicine (34% versus 9%), more likely to report no (25% versus 6%), and less likely to report not sure (41% versus 84%).

In the clinical vignettes (see Table 4), pulmonologists and PCPs reported similar responses. Both recommended LDCT most often for vignette 1 (81% of PCPs and 100% of pulmonologists), the scenario that met recommended screening guideline criteria for all organizations except the AAFP. For

TABLE 2.
Lung Cancer Screening Opinions by Provider Specialty

Statement	Pulmonologists N = 17		Primary care providers N = 72		P value
	N	%	N	%	
<i>I am convinced that screening for lung cancer is beneficial for patients</i>					
Strongly agree	6	35.3	4	5.8	< 0.001
Agree	9	52.9	22	31.9	
Undecided	2	11.8	33	47.8	
Disagree	0	0	10	14.5	
Strongly disagree	0	0	0	0	
Missing	0	-	3	-	
<i>Inconsistent recommendations about lung cancer screening make it difficult to decide whether or not to screen</i>					
Strongly agree	2	11.8	8	11.4	0.667
Agree	5	29.4	34	48.6	
Undecided	2	11.8	7	10.0	
Disagree	7	41.2	18	25.7	
Strongly disagree	1	5.9	3	4.3	
Missing	0	-	2	-	
<i>Screening for lung cancer is cost-effective</i>					
Strongly agree	0	0	1	1.4	0.020
Agree	8	47.1	9	12.9	
Undecided	8	47.1	41	58.6	
Disagree	1	5.9	11	15.7	
Strongly disagree	0	0	8	11.4	
Missing	0	-	2	-	
<i>I rely on the recommendations of local specialists regarding lung cancer screening in my practice</i>					
Strongly agree	3	19.7	0	0	< 0.001
Agree	9	52.9	16	23.2	
Undecided	0	0	12	17.4	
Disagree	5	29.4	35	50.7	
Strongly disagree	0	0	6	8.7	
Missing	0	-	3	-	
<i>I have enough knowledge to explain the pros and cons of lung cancer screening to my patients</i>					
Strongly agree	4	25.0	9	13.0	0.299
Agree	9	56.3	33	47.8	
Undecided	3	18.8	12	17.4	
Disagree	0	0	14	20.3	
Strongly disagree	0	0	1	1.5	
Missing	1	-	3	-	
<i>Time restrictions during a patient's clinic visit mean other presenting problems have higher priority than screening for lung cancer</i>					
Strongly agree	2	11.8	10	14.7	0.012
Agree	5	29.4	36	52.9	
Undecided	7	41.2	8	11.8	
Disagree	2	11.8	14	20.6	
Strongly disagree	1	5.9	0	0	
Missing	0	-	4	-	

TABLE 3.
Professional Organization Lung Cancer Screening Guideline Knowledge by Provider Specialty

Professional organization	Pulmonologists' response			Primary care providers' response			P value
	Recommend screening?			Recommend screening?			
	Yes N (%)	No N (%)	Not sure N (%)	Yes N (%)	No N (%)	Not sure N (%)	
US Preventive Services Task Force	13 (76.5)*	0 (0)	4 (23.5)	57 (87.7)*	4 (6.2)	4 (6.2)	0.067
American Cancer Society	10 (58.8)*	0 (0)	7 (41.2)	35 (53.9)*	2 (3.1)	28 (43.1)	0.743
American College of Chest Physicians	13 (76.5)*	0 (0)	4 (23.5)	25 (38.5)*	1 (1.5)	39 (60.0)	0.019
American Academy of Family Physicians	2 (11.8)	1 (5.9)*	14 (82.4)	14 (21.9)	10 (15.65)*	40 (62.5)	0.297

*Indicates correct choice.

vignette 2, the majority of both groups recommended no screening in accordance with the USPSTF, ACS, ALA, ATS, ASCO, and ACCP guidelines. In vignette 3, providers were split, with 47.1% of pulmonologists and 51.5% of PCPs recommending LDCT. In this vignette, a similar proportion said they would not screen and slightly more pulmonologists said they needed more information than PCPs (35% versus 25% respectively). The responses for vignette 3 indicate the complexities involved in making decisions around lung cancer screening. Family Medicine and Internal Medicine reported similar responses for all clinical vignettes.

During the 12 months preceding the survey, 76.5% of pulmonologists reported ordering a LDCT for lung cancer screening, compared to 41.2% of PCPs ($P = .002$) (see Table 5). A similar proportion of both pulmonologists (70.6%) and PCPs (41.8%) who ordered a LDCT reported discussing results of the scan with their patient. Less than 15% of physicians reported referring a patient to another provider for evaluation of lung cancer screening. Over 90% of pulmonologists and PCPs reported referring patients to various smoking cessation programs during the prior 12 months. Within PCPs, Internal Medicine physicians were more likely to report yes than Family Medicine (58% versus 42%) for the question "In last 12 months, did you discuss results of LDCT for lung cancer screening?"

Pulmonologists and PCPs reported similar barriers for recommending or referring patients for lung cancer screening. The most commonly cited barrier was cost to patients (82.4% of pulmonologists and 77.8% of PCPs). Other barriers to screening included potential for emotional harm (58.8% pulmonologists and 58.3% PCPs), potential for complications (47.1% pulmonologists and 59.7% PCPs), too many false positives (47.1% pulmonologists and 69.4% PCPs), cost to the health care system (47.1% pulmonologists and 54.2% PCPs), and low patient acceptance (41.2% pulmonologists and 37.5% PCPs).

Discussion

Based on our survey, significant differences existed in opinions and practices of pulmonologists and PCPs regarding lung cancer screening. Pulmonologists were more likely than PCPs to report positive aspects of lung cancer screen-

ing, such as the benefit to patients and cost-effectiveness. A higher proportion of pulmonologists reported ordering a LDCT for lung cancer screening for an asymptomatic patient during the 12 months before the survey compared to PCPs. This may be due to the higher prevalence of chronic heavy smokers in pulmonology clinics than in PCP practices. It is also possible that PCPs may be referring patients to specialists for further evaluation and the specialists may be ordering the LDCT exam. In our study, factors likely to contribute to LDCT ordering rates were similar between groups, such as having sufficient knowledge to initiate conversation and explain the risks and benefits of screening. One important difference that may explain some of the variation in ordering lung cancer screening is that PCPs more often reported time limitations during the patient's visit compared with pulmonologists. In addition, patient visits with pulmonologists are focused on lung- and breathing-related health, allowing for more time to consider lung screening as part of overall lung health.

Several prior studies surveyed family physicians and other PCPs regarding their attitudes and knowledge of lung cancer screening. A 2015 survey of family physicians in South Carolina identified similar barriers and perceived risks of screening as in our study [16]. Specifically, concern about patient stress or anxiety was a perceived risk among 52% of family physicians, compared to the 58% of PCPs in our survey who reported emotional harm to patients as a barrier. In 2 studies conducted among family physicians and PCPs, 83%-88% expressed concern over the potential for unnecessary diagnostic procedures and false positive findings [12, 16], which is similar to PCPs in our study indicating concern over false positives (69%) and potential for complications (60%) [16].

We found that pulmonologists and PCPs identified similar barriers to screening. Cost to the patient was the most often-cited concern, which is similar to the 2013 data from the Lewis study (87%) [12]. Although CMS began covering the cost of lung cancer screening in 2015, it is possible that at the time of our survey, physicians may not have been aware of this coverage or they may have been concerned that additional follow-up would increase out-of-pocket expenses. While insurance may cover the cost of the initial LDCT

screening test, follow-up diagnostic testing is likely subject to deductibles and further out-of-pocket expenses. Providers and patients are both increasingly aware of these expenses and some clinicians may be concerned about the financial strain of diagnostic tests [24]. Policy interventions aimed at reducing uncertainty regarding out-of-pocket expenses may help patients and providers make more informed decisions about screening.

In our study, 38% of PCPs agreed or strongly agreed that screening for lung cancer is beneficial for patients, which was similar to findings of prior studies examining the proportion of physicians who believe that screening reduces lung cancer mortality (41% and 42%, respectively) [12, 16]. Approximately 62% of PCPs in our study had initiated a discussion regarding the benefits and harms of screening, which is similar to the 72% of PCPs in the Los Angeles County study by Raz and colleagues [16]. In our study, 41% of PCPs reported ordering a LDCT for lung cancer screening in the prior 12 months, which is similar to other studies that reported 52%–53% [15, 16].

Prior work examining pulmonologists' attitudes toward lung cancer screening includes a national survey to pulmonologists in Veterans Health Administration clinics from July 2013 to February 2014 and an international sample of ATS clinicians from March to April of 2014 [13, 18]. Among pulmonologists in Veterans clinics, the most commonly cited barriers to screening were poor infrastructure and lack of clinical personnel. Respondents of the ATS survey who said they would screen an NLST-eligible patient reported the following barriers to screening: false positives (52%), overdiagnosis (44%), and high cost to the health care system (33%) [13].

The AAFP does not currently recommend lung cancer

screening, stating that the evidence is insufficient to recommend for or against screening [9]. The AAFP has expressed concerns that lung cancer screening recommendations are based on a single study and that NLST results have not been replicated in community settings. While initial findings from the Lahey Hospital & Medical Center are similar to the cancer detection and incidental finding rates of the NLST [25], there remains a paucity of data on LDCT screening in real-world settings. We found that most PCPs and pulmonologists were unsure of AAFP recommendations around lung cancer screening. While it is not surprising that pulmonologists lack this knowledge, less than 20% of PCPs knew the AAFP stance on lung cancer screening, which suggests that most PCPs are more aware of guidelines from the USPSTF.

In our sample of providers, both pulmonologists and PCPs reported spending less than 50% of their time in outpatient care (mean time 29% and 45%, respectively). The relatively low proportion of time spent in outpatient care is likely reflective of: 1) the inclusion of resident physicians who spend a significant amount of their time on inpatient work; 2) academic pulmonologists often spending more time in the inpatient setting, covering the intensive care unit and the pulmonary inpatient service; and 3) academic physicians having teaching and research responsibilities that limit their practice time, as compared to community physicians.

Limitations

Our study has several limitations. Surveyed physicians were part of a large academic medical center, and our results may not be generalizable to other practice settings. However, to our knowledge, our study is the first to survey both PCPs and pulmonologists in the same institution, allowing for a direct comparison. The responses are

TABLE 4.
Recommended Lung Cancer Screening Strategies for 3 Clinical Vignettes

Vignette	Description	Pulmonologists			Primary care providers			P value
		Recommend screening strategy			Recommend screening strategy			
		No screening N (%)	LDCT N (%)	Need additional information N (%)	No screening N (%)	LDCT N (%)	Need additional information N (%)	
1	Healthy 60-year-old, former smoker that has a 30 pack-year history and quit smoking 1 year ago	0 (0)	17 (100)	0 (0)	6 (8.8)	55 (80.9)	7 (10.3)	0.147
2	Healthy 55-year-old, former smoker that has a 15 pack-year history and quit smoking 20 years ago	12 (70.6)	1 (5.9)	4 (23.5)	59 (86.8)	5 (7.4)	4 (5.9)	0.083
3	Healthy 62-year-old, former smoker that has a 40 pack-year history, quit smoking 16 years ago, and was exposed to asbestos in the workplace	3 (17.7)	8 (47.1)	6 (35.3)	16 (23.5)	35 (51.5)	17 (25.0)	0.672

Note. LDCT, low-dose computed tomography.

TABLE 5.
Lung Cancer Screening Practices by Pulmonologists versus Primary Care Providers

Statement	Pulmonologists N = 17		Primary care providers N = 72		P value
	N	%	N	%	
<i>In last 12 months, did any of your patients ask if they should be screened for lung cancer with LDCT?</i>					
Yes	8	50.0	18	27.3	0.203
No	7	43.8	44	66.7	
Don't recall	1	6.3	4	6.1	
Missing	1	-	6	-	
<i>In last 12 months, did you order LDCT for LCS?</i>					
Yes	13	76.5	28	41.2	0.002
No	3	17.6	40	58.8	
Don't recall	1	5.9	0	0	
Missing	0	-	4	-	
<i>In last 12 months, did you initiate LCS discussion re benefits/harms?</i>					
Yes	14	82.4	42	61.8	0.097
No	2	11.8	25	36.8	
Don't recall	1	5.9	1	1.5	
Missing	0	-	4	-	
<i>In last 12 months, did you discuss results of LDCT for lung cancer screening?</i>					
Yes	12	70.6	28	41.8	0.088
No	5	29.4	35	52.2	
Don't recall	0	0	4	6.0	
Missing	0	-	5	-	
<i>In last 12 months, did you refer patient to another provider for evaluation of lung cancer screening?</i>					
Yes	1	5.9	10	14.7	0.539
No	16	94.1	57	83.8	
Don't recall	0	0	1	1.5	
Missing	0	-	4	-	
<i>Have you referred patients to any of the following smoking cessation programs?</i>					
QuitlineNC	13	76.5	55	76.4	0.994
1-800-Quit NOW	13	76.5	52	72.2	0.723
Local Nicotine Dependence Program	13	76.5	45	62.5	0.277
ACS Freedom from Smoking	1	5.9	0	0	0.038
Alternative Provider	3	17.6	14	19.4	0.865
Any Program	16	94.1	66	91.7	0.736

Note. LCS, lung cancer screening; LDCT, low-dose computed tomography.

self-reported and some of the survey questions asked practitioners about events from the past 12 months, so it is possible that responses may be susceptible to recall bias. While our survey response rate of 40% was not ideal, it is in line with prior web-based surveys to physicians regarding lung cancer screening, which ranged from 4.8% to 60% [12, 15, 16, 18]. In addition, there is the potential for non-response bias given our overall response rate. Future studies should collect information on non-respondents or include auxiliary data on the sampling frame to address nonresponse bias. It is also possible that survey responses could be subject to social desirability bias.

Conclusion

As lung cancer screening is now a covered preventive service in the United States, the role of the PCP will be critical for screening in the setting of patient care. Our survey

showed that the majority of PCPs are uncertain about referring patients for lung cancer screening, citing concerns regarding potential harms and cost. Understanding the opinions, beliefs, knowledge, and practice patterns of PCPs and pulmonologists may result in improved educational programs and development of comprehensive infrastructures that strengthen support and collaboration among the various physicians who are charged with providing this preventive service. **NCMJ**

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