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Patient and primary care provider attitudes and adherence towards lung cancer screening at an academic medical center

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ABSTRACT

Low dose CT (LDCT) for lung cancer screening is an evidence-based, guideline recommended, and Medicare approved test but uptake requires further study. We therefore conducted patient and provider surveys to elucidate factors associated with utilization. Patients referred for LDCT at an academic medical center were questioned about their attitudes, knowledge, and beliefs on lung cancer screening. Adherent patients were defined as those who met screening eligibility criteria and completed a LDCT. Referring primary care providers within this same medical system were surveyed in parallel about their practice patterns, attitudes, knowledge and beliefs about screening. Eighty patients responded (36%), 48 of whom were adherent. Among responders, non-Hispanic patients ($p = 0.04$) were more adherent. Adherent respondents believed that CT technology is accurate and early detection is useful, and they trusted their providers. A majority of non-adherent patients (79%) self-reported an intention to obtain a LDCT in the future. Of 36 of 87 (41%) responding providers, only 31% knew the correct lung cancer screening eligibility criteria, which led to a 37% inappropriate referral rate from 2013 to 2015. Yet, 75% had initiated lung cancer screening discussions, 64% thought screening was at least moderately effective, and 82% were interested in learning more of the 33 providers responding to these questions. Overall, patients were motivated and providers engaged to screen for lung cancer by LDCT. Non-adherent patient "procrastinators" were motivated to undergo screening in the future. Additional follow through on non-adherence may enhance screening uptake, and raising awareness for screening eligibility through provider education may reduce inappropriate referrals.

1. Introduction

Lung cancer remains the leading cause of cancer death in the U.S. for both men and women with a staggering 200,000 new cases and 150,000 deaths expected in 2016 alone (Torre et al., 2015; Siegel et al., 2015). Screening for lung cancer by imaging has been an active area of investigation for decades with equivocal results (Fontana et al., 1984; Henschke et al., 1999; International Early Lung Cancer Action Program I et al., 2006) until the National Lung Screening Trial (NLST) in 2011 provided a definitive answer (National Lung Screening Trial Research T et al., 2011). The NLST was a large, multi-center, randomized trial that reported a 20% reduction in the risk of lung cancer-specific mortality for three annual low dose CT (LDCT) screens among active or prior heavy smokers aged 55 to 74 years old. Based on this result, LDCT lung cancer screening for patients at high risk of lung cancer is now an evidence-based recommendation by the United States Preventive Services Task Force (USPSTF), and a covered test by the Centers for Medicare and Medicaid Services (CMS).

The public has positively viewed evidence-based cancer screening enthusiastically for years, (Schwartz et al., 2004) and national colon, breast and cervical cancer screening rates are currently 58%, 73% and 81% respectively (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6417a4.htm?s_cid=mm6417a4_w). Despite national guideline

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recommendations for lung cancer screening with LDCT, the adoption of this evidenced-based screening at the national policy level, endorsements by multiple professional societies, and studies demonstrating cost-effectiveness (Black et al., 2014), uptake in many academic centers – which is governed by physician practices and patient volition – still remains low in the initial years following the publication of the NLST (Hoffman et al., 2015; Lewis et al., 2015). Since the uptake of LDCT and best practices to drive its adoption remains to be determined, we sought to investigate LDCT screening uptake within an academic setting by surveying patients and providers on their attitudes, knowledge, and beliefs regarding LDCT. Our goal was to identify facilitators and barriers to lung cancer screening within our medical center for improved adoption moving forward.

2. Methods

We evaluated 221 patients and 81 primary care providers from the Stanford Health Care (SHC) system and administered two separate, structured surveys for each group. Patients were interviewed by phone and providers completed an online survey. Survey implementation was performed using Qualtrics software (Qualtrics, Provo UT). All study related processes and materials were approved by the Stanford Institutional Review Board.

2.1. Study recruitment & data collection

2.1.1. Patient survey

We conducted a survey from August 2015 to January 2016 for patients referred for LDCT screening from 2013 to 2015 through Stanford's Lung Cancer Screening Program. Referrals were based on the NLST and National Comprehensive Cancer Network (NCCN) LDCT eligibility criteria. To identify eligible patients (those who actually were LDCT eligible by these consensus guidelines regardless of whether or not they were referred), we reviewed the electronic medical record (EMR) from patient charts (Fig. 1). NLST criteria were defined by patients 55–74 years old with a current or past smoking history (within 15 years) of at least 30 pack years (National Lung Screening Trial Research T et al., 2011). NCCN criteria were defined by patients >50 years old with a smoking history of at least 20 pack years (ever) and one additional risk factor such as Chronic Obstructive Pulmonary Disease (COPD), pulmonary fibrosis, a family member with lung cancer, major exposure to substances associated with lung cancer (i.e. radon, asbestos, or silica), or a past history of lymphoma, esophageal cancer, lung or head and neck cancer (Wood et al., 2015).

The patient survey consisted of 38 questions derived from previous work (http://www.cpic.org/page/stars/) and internal discussions among our study group with expertise in conducting survey research and lung cancer screening. All LDCT eligible patients were mailed an invitation letter to participate and were contacted by phone up to 5 times on a weekly basis in order to complete the survey. Two trained interviewers (DKD, HN) administered the surveys in a standardized fashion with questions covering past screening for lung and other cancers, reasons for undergoing or not undergoing LDCT, smoking behavior, and general socio-demographic information (Appendix 1). The average completion time for the survey was 11 min.

We based ethnicity and race on self-report for survey responders. Multi-racial patients were classified according to their minority race. We obtained patient information on age at the time of screening, sex, cancer history, insurance status, provider location, county of residence and ethnicity (but not race) from the EMR for non-responders to compare these data to responders.

2.1.2. Provider survey

Stanford primary care providers were recruited by e-mail from a study author (BS). An on-line link to the self-administered survey instrument was included in the e-mail correspondence after on-line consent. This survey was designed from previous literature and internal discussion among our study group with expertise in conducting survey research and lung cancer screening (Lewis et al., 2015; Henderson et al., 2011; http://healthcaredelivery.cancer.gov/screening_rp/screening_rp_colo_lung_inst.pdf). The on-line provider survey took an average of 15 min to complete, and included 27 questions on the following topics: knowledge of LDCT screening guidelines, LDCT referral practice, barriers and facilitators to LDCT referral, interest in learning more about

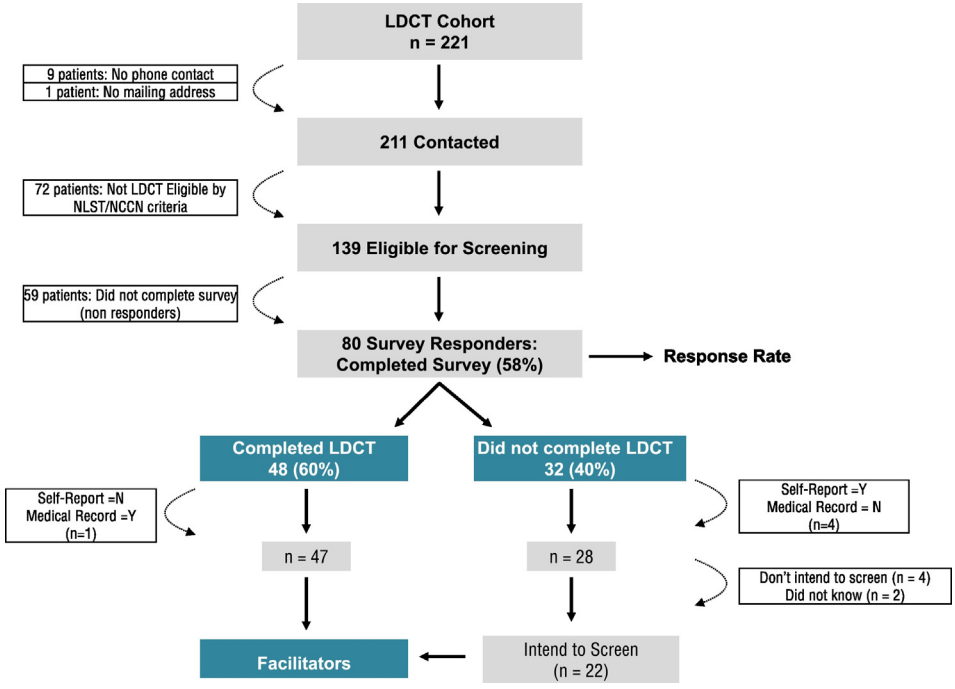

Fig. 1. We screened our program's lung cancer screening LDCT database to identify 221 patients, of which 139 were considered eligible by current guidelines. Eighty patients participated (response rate = 80/139; 58%) 48 of whom adhered to a prescribed LDCT and 32 who did not adhere. These two groups were analyzed for differences in patient demographics (Table 2). We then examined responses for those who were adherent and compared them to those who were not adherent but intended to make an appointment (Fig. 2).

LDCT screening, and questions regarding providers' primary care practice setting, training, and socio-demographic characteristics (Appendix 2).

2.2. Analysis

We compared socio-demographic characteristics between patient respondents (i.e. those who completed the survey) and non-respondents (i.e. those who did not) for LDCT eligible patients. Among respondents, we compared socio-demographic and clinical characteristics between LDCT adherent (i.e., those who completed the survey AND followed through with a prescribed LDCT) and non-adherent patients (i.e., those who completed the survey AND DID NOT follow through with a prescribed LDCT).

Self-reported LDCT adherence was verified by the EMR (Fig. 1). Facilitators to screening adherence were then examined among patients who were LDCT adherent and those who were non-adherent. Our sample size was too small to execute a meaningful analysis ($n = 4$) for those who had not adhered to a prescribed LDCT and did not intend to get screened. We therefore examined reasons for LDCT adherence between those who were adherent and "procrastinators" (those who were not adherent but intended to make an appointment in the future) to elucidate whether there may be differences in attitudes and beliefs between these two groups.

For providers, responses were tabulated and analyzed descriptively. We defined knowledgeable providers as those who correctly identified criteria for either NLST or NCCN LDCT screening. Appropriate CT referrals were defined as those placed by providers for patients who met LDCT eligibility. We stratified these data by the year of the prescribed order for further analysis.

For both surveys, descriptive statistics were computed using the mean and standard deviation or median and interquartile range (IQR) for continuous variables, and frequency counts and percentages for categorical variables. To test for statistical differences across the comparison groups, we used a Student's *t*-test for continuous variables and Chi-squared or Fisher's Exact tests for categorical variables as appropriate.

3. Results

3.1. Patients

From 2013 to 2015, 221 patients had a LDCT ordered at SHC, 211 were contacted and invited to respond to the survey, 139 met criteria for LDCT by NLST or NCCN guidelines, and 80 of these 139 (58%) responded to the survey by phone (Fig. 1). Of the 80 patients who were LDCT eligible and responsive to our survey, 48 (60%) received LDCT screening, and 32 (40%) did not. Seventy-seven respondents (96%) underwent some form of cancer screening (Table 1), and 98% of LDCT adherent respondents were aware they had undergone a test specifically for lung cancer screening. Survey respondents' mean age was 65 ± 7 years, 45 (56%) were male and 74 (93%) were non-Hispanic. The majority of respondents lived locally, had public insurance, and were cared for by Stanford providers.

Although not statistically significant, younger, white, and female patients showed trends towards better adherence. On the other hand, Hispanics were significantly more non-adherent ($p = 0.04$) (Table 2). When comparing those who adhered to a LDCT physician's order and those who did not, no significant differences or trends were found for

Table 1
General screening adherence for survey respondents[a].

	Breast/mammogram $n = 35$[b]	Cervical/PAP $n = 35$[c]	Colon/colonoscopy $n = 80$
Survey respondents	91%	94%	86%
California data[d]	83%	75%	67%
National data[d]	79%	75%	69%

PAP – Papanicolaou smear.
[a] $n = 80$; $n = 35$ for female specific screening.
[b] 50+ years old.
[c] 18+ years old.
[d] National Cancer Institute, state cancer profiles in 2014 (https://statecancerprofiles.cancer.gov/; http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6417a4.htm?s_cid=mm6417a4_w).

Table 2
Characteristics of survey respondents.

	All patients, n (%) $n = 80$	Non-adherent patients, n (%) $n = 32$	Adherent patients, n (%) $n = 48$	*p*-Value[a]
Age (y)	65 ± 7	64 ± 6	66 ± 7	0.11
Gender				0.07
Male	45 (56)	22 (69)	23 (48)	
Female	35 (44)	10 (31)	25 (52)	
Ethnicity				0.04
Hispanic	6 (7)	5 (16)	1 (2)	
Not Hispanic	74 (93)	27 (84)	47 (98)	
Race[b,c]				0.08
White	65 (81)	23 (72)	42 (87.5)	
Black	3 (4)	2 (6)	1 (2)	
Asian	3 (4)	2 (6)	1 (2)	
Hispanic	6 (8)	5 (16)	1 (2)	
Multi-racial	3 (4)	0 (0)	3 (6)	
History of cancer[d]				0.38
Yes	5 (6)	3 (9)	2 (4)	
No	75 (94)	29 (91)	46 (96)	
County[e]				0.92
Local	57 (72.5)	23 (72)	34 (71)	
Distant	23 (27.5)	9 (28)	14 (29)	
Foreign born				
Yes	15 (19)	7 (22)	8 (17)	0.56
No	65 (81)	25 (78)	40 (83)	
Education[b]				0.36
<Bachelor's degree	20 (25)	10 (31)	10 (21)	
College graduate	25 (31)	11 (34)	14 (29)	
≥Graduate degree	35 (44)	11 (34)	24 (50)	
Insurance[b,f]				0.35
Public (government)	50 (62.5)	18 (56)	32 (67)	
Private (HMO, PPO etc.)	30 (37.5)	14 (44)	16 (33)	
Occupation[b,g]				
Health care related	10 (12.5)	4 (12.5)	6 (12.5)	1.00
Not health care related	70 (87.5)	28 (87.5)	42 (87.5)	
Provider location				0.83
Stanford	61 (76)	24 (75)	37 (77)	
Not Stanford	19 (24)	8 (25)	11 (23)	

HMO – Healthcare Maintenance Organization; PPO – Preferred Provider Organization.
[a] Between adherent and non-adherent groups using a Student's *t*-test for continuous variables and a Chi-squared analysis (or Fisher's exact test for $n \leq 5$) for categorical variables.
[b] Self-reported.
[c] *p*-Value shown is for comparison of white vs all other races combined.
[d] Excluded non-melanoma skin cancers.
[e] Local counties include Santa Clara and San Mateo. Distant counties include Alameda, Solano, Monterey, San Francisco, Santa Cruz, Merced, San Benito, Napa, Humboldt, Stanislaus, Out of State, San Diego, Marin, Sonoma, Lake County, Mariposa, Nevada County, Fresno, San Joaquin, and Butte.
[f] Public insurance included government plans Medicare, MediCal, Covered California plan, and Worker's Comp. Private included employer-provided health care or individual/family private insurances. If a patient had multiple insurances, we defaulted to their Medicare plan followed by private plan for analysis.
[g] Health care related professions included physicians, nurse practitioners, nurses, occupational therapist, phlebotomist, and administrators in medical offices.

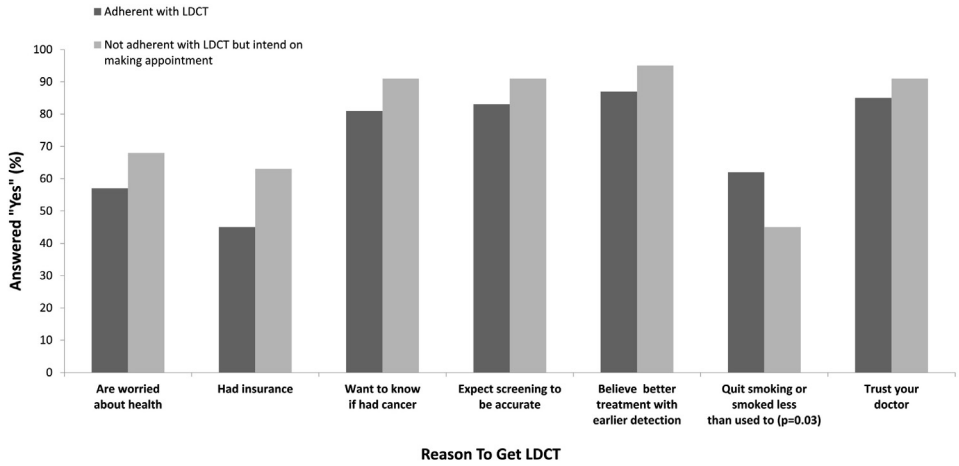

Fig. 2. Facilitators for LDCT were compared between those who were adherent and those who were non-adherent but intended to make an appointment. Many patient "procrastinators" who were non-adherent after missing an appointment ($n = 22/28$; 79%) reported wanting to perform a LDCT and their attitudes towards screening were similar to adherent patients. The reported p-value was calculated using Chi-squared analysis.

cancer history, residential area, level of education, type of insurance, occupation, being of foreign birth, and provider location.

In Fig. 2 we show patients' knowledge and attitudes via self-report towards LDCT between these two groups. LDCT adherent patients reported feeling that CT technology is accurate, early detection is useful, and trusting their providers as the most common reasons to undergo LDCT. They also reported wanting to know if they might have cancer as an important reason to adhere. Twenty-two of 28 patients (79%) who had not had their prescribed LCDT reported wanted to do one in the future. Overall, the attitudes between those who were adherent and patient "procrastinators" were very similar. Additionally, those who quit smoking or who smoke less than they used to were more adherent with a prescribed LDCT ($p = 0.03$). Of note and as displayed in Fig. 1, participants who had a discrepancy in their adherence per self-report versus EMR review were excluded from these analyses.

In Table 3 we show characteristics of LDCT eligible respondents and non-respondents using data obtained from the EMR. Patient respondents were similar to non-respondents, but respondents were more likely to be publicly insured ($p = 0.03$). Importantly, LDCT adherence between the respondent and non-respondent groups was not significantly different (60% vs 51%, $p = 0.28$). Thirteen eligible non-respondents had unknown insurance status and were excluded from analysis for this variable.

3.2. Providers

Thirty-six of the 87 providers from the SHC primary care group responded to the survey (41%), and 31 completed the survey in its entirety (36%). Of these 31, twenty-four (77%) of these providers were female and 17 (55%) were white. Experience was broadly distributed, with 7 (23%) having practiced medicine for <4 years, 6 (19%) from 5 to 9 years, 3 (10%) from 10 to 14 years, and 15 (48%) for 15 or more years.

Thirty-two providers (89%) reported either being aware or influenced by USPSTF lung cancer screening guidelines in their practice, but their awareness of appropriate NCCN or NLST guidelines was low. Only 11 providers (31%) answered age and smoking eligibility criteria correctly. Despite this fact, 27 (75%) providers had initiated a discussion regarding lung cancer screening and 21 (58%) had ordered a LDCT for lung cancer screening.

Many providers (64%) believed current screening guidelines were at least moderately effective and 82% were interested in learning more about lung cancer screening with an on-line lecture being the preferred method of education (59%) lasting up to 30 min (52%).

Providers surveyed did not show a high degree of concern for false positive results.

(never/rarely/sometimes concerned – 85%), potential harm to patients from these false positive results (never/rarely/sometimes concerned – 86%), and patient co-morbidities (never/rarely/sometimes

Table 3
Characteristics of patients eligible for low-dose CT screening.

	Eligible for screening[a], n (%) $n = 139$	Survey respondents, n (%) $n = 80$	Survey non-respondents, n (%) $n = 59$	p-Value[b]
Age (y)	65 ± 6	65 ± 7	65 ± 6	0.44
Gender				0.11
Male	86 (61)	45 (56)	41 (70)	
Female	53 (38)	35 (44)	18 (31)	
Ethnicity				0.21
Hispanic	12 (9)	6 (7.5)	6 (10)	
Non-Hispanic	127 (91)	74 (92.5)	53 (90)	
History of cancer[c]				0.53
Yes	11 (8)	5 (6)	6 (10)	
No	128 (92)	75 (94)	53 (90)	
County[d]				0.66
Local	97 (70)	57 (71)	40 (68)	
Distant	42 (30)	23 (29)	19 (32)	
Insurance[e,f]				0.03
Public	71 (56)	51 (64)	20 (43)	
Private	55 (44)	29 (36)	26 (57)	
Provider location				0.37
Stanford	102 (73)	61 (76)	41 (70)	
Not Stanford	37 (27)	19 (23)	18 (31)	
Received LDCT				0.28
Yes	78 (56)	48 (60)	30 (51)	
No	61 (44)	32 (40)	29 (49)	

[a] Between group comparison performed using a Student's t-test for continuous variables and a Chi-squared analysis (or Fisher's exact test for $n \leq 5$) for categorical variables.
[b] Low-Dose CT eligibility based on National Lung Screening Trial or National Comprehensive Cancer Network criteria for lung cancer screening.
[c] Excluded non-melanoma skin cancers.
[d] Local counties include Santa Clara and San Mateo. Distant counties include Alameda, Solano, Monterey, San Francisco, Santa Cruz, Merced, San Benito, Napa, Humboldt, Stanislaus, Out of State, San Diego, Marin, Sonoma, Lake County, Mariposa, Nevada County, Fresno, San Joaquin, and Butte.
[e] Public insurance included government plans Medicare, MediCal, Covered California plan, and Worker's Comp. Private included employer-provided health care or individual/family private insurances. If a patient had multiple insurances, we defaulted to their Medicare plan followed by private plan for analysis.
[f] 13 subjects without known insurance information were excluded from this analysis.

Table 4
Concerns and perceived barriers regarding lung cancer screening among referring providers[a].

Survey question	Never	Rarely	Sometimes	Usually
Not enough time ($n = 25$)	0 (0%)	2 (8%)	18 (72%)	5 (20%)
Patient unaware of lung cancer screening ($n = 25$)	0 (0%)	0 (0%)	7 (28%)	18 (72%)
Patient can't afford/lacks insurance ($n = 25$)	5 (20%)	7 (28%)	12 (48%)	1 (4%)
Shortage of trained providers ($n = 14$)	7 (50%)	3 (21%)	3 (21%)	1 (7%)
High false positives ($n = 14$)	0 (0%)	3 (21%)	9 (64%)	2 (14%)
Potential harm of unnecessary diagnostic procedures ($n = 14$)	0 (0%)	4 (29%)	8 (57%)	2 (14%)
Patient co-morbidities ($n = 14$)	0 (0%)	3 (21%)	8 (57%)	3 (21%)
Patient unwillingness to undergo screening or treatment ($n = 14$)	0 (0%)	8 (57%)	5 (36%)	1 (7%)

[a] Out of 36 Stanford providers, the number who answered is reported in parentheses next to the relevant question.

concerned – 78%). Perceived barriers to provider care included lack of patient awareness of LDCT screening (sometimes/usually concerned – 100%) and not having enough time during a patient visit to discuss the screening test (sometimes/usually concerned – 92%) (Table 4).

3.3. Referral rates for LDCT

Since we reviewed the charts of all patients who were referred for LDCT from 2013 to 2015 as part of this study ($n = 221$), we were able to identify the subgroup of patients referred by Stanford primary care providers only ($n = 163$). One-hundred-and-two of 163 patients (63%) were appropriately referred by Stanford providers which was similar in proportion to the 37 of 58 patients (64%) that were appropriately referred by non-Stanford providers from 2013 to 2015.

For all referrals, 35 patients (16%) were referred in 2013, 49 in 2014 (22%), and 136 (62%) in 2015 (one patient was excluded as the year of referral was not clear). Appropriate referrals for Stanford providers only increased slightly from 59% in 2013 to 63% in 2015 ($p = 0.93$).

4. Discussion

Survey respondents who qualified for lung cancer screening from 2013 to 2015 adhered to LDCT screening at a frequency of 60% at our medical center. In general, our patients were receptive to screening, and younger, white and female patients were more likely to follow through with a prescribed CT, and Hispanics were less likely to follow through with a prescribed CT. Patient “procrastinators” who failed to undergo an initial prescribed LDCT were still interested in obtaining one and providers were under informed but aware and engaged in lung cancer screening. Importantly, the vast majority of primary care providers were willing to learn more about LDCT screening.

Previously published qualitative studies on LDCT screening prior to CMS coverage showed that patients' fatalistic beliefs, fear of radiation exposure, and anxiety related to CT scans were all significantly associated with decreased intention to screen (Jonnalagadda et al., 2012), but these factors did not appear influential on our post CMS coverage study group. At our medical center, patients had an overall positive outlook on lung cancer screening with LDCT. These results are in-line with historical public perceptions and one very recent study reporting that 77% of 338 patients who qualified for lung cancer screening would “agree to a CT today” (Cataldo, 2016). The high proportion of willingness to screen may also be attributed to the education level of our study population that consisted of 75% college graduates (Meissner et al., 2006).

Our study also suggests that those who quit smoking or do not smoke as much as they used to were more likely to be adherent ($p = 0.03$). This is consistent with existing literature noting that smokers are less likely to seek out care for lung cancer (Corner et al., 2006; Friedemann Smith et al., 2016). Thus, abstinence from smoking could be a useful indicator of a patient's likelihood to follow through with screening. In addition, more effort should be devoted to current smokers to increase screening adherence since they are the population at the highest risk for lung cancer (Bach et al., 2003).

Patient adherence clearly relies on primary care provider practices. The similarity in patients' attitudes and perceptions between adherent and non-adherent respondents who intended on getting one in the future is promising and suggests that repeat referrals and ongoing encouragement through shared decision making between primary care physicians and patients could improve adherence. To this end, a recent lung cancer screening study among Korean men showed that providers who discussed the benefits of LDCT screening with their patients increased screening participation from 10% to 95% (Nhung et al., 2015).

While our providers were engaged, they were not fully informed on the actual screening criteria. Our providers reported a high awareness of USPSTF lung cancer screening guidelines that influenced their practice, but only 31% accurately identified the appropriate criteria for screening. This likely resulted in the observed 37% inappropriate referral rate from 2013 to 2015.

Lung cancer screening practice for primary care providers may be evolving. Prior to the release of the NLST and high-quality evidence to support LDCT screening, one quarter of 962 family practice providers, general internists and general practitioners that responded to a national mail survey in 2010 thought there was sufficient evidence to warrant screening, and 26% of this sub-group would do so with LDCT (Klabunde et al., 2010). Surprisingly, this rate has not increased in more contemporary studies following the publication of the NLST, where one study tracked primary care providers practice patterns at an academic medical center in 2013 and another at federally qualified community health centers in 2014 (Hoffman et al., 2015; Lewis et al., 2015). Our providers, surveyed in 2015 after the release of the USPSTF grade B recommendation and CMS's decision to cover lung cancer screening, were markedly more engaged in screening. The 58% of providers who ordered a LDCT at our center was much higher than prior reports from another academic medical center from 2013 (12%) (Lewis et al., 2015) and a national survey results of family practitioners prior to current guideline recommendations (22%) (Klabunde et al., 2012).

Difficulties with the appropriate selection of patients and adoption of screening are not unique to lung cancer screening and have been observed during the initial roll-out of colorectal cancer screening (Klabunde et al., 2003). Recognition of ongoing work to improve knowledge gaps for providers will be crucial to optimize lung cancer screening delivery. Encouragingly, four out of five of our providers were interested in learning more about LDCT screening for lung cancer, regardless of whether or not they had ordered one. They were most interested in receiving education on screening in an on-line format.

Our study has several strengths including its use of contemporaneous study populations, and the parallel sampling of patients and providers during the same time period using de novo survey instruments for analysis (Appendices 1, 2). In addition, we used the EMR to capture information on patient characteristics of survey non-responders that would not be available otherwise. There are limitations with our study, however. The modest study sample of 139 eligible patients and 80 survey respondents may have resulted in an underpowered study that did not detect true differences between adherent and non-adherent groups. Similarly, we surveyed a modest group of providers that were based solely at an academic referral center. Additionally, our

surveyed group of patients underwent breast, colon, and cervical cancer screening with greater adherence than California or U.S. populations (Table 1), which likely speaks to the high compliance of our patient population and may limit the generalizability of this study. We also had a small number of underrepresented minorities, who are known to have different attitudes towards lung cancer screening (Jonnalagadda et al., 2012). Last, both surveys had a modest response rate (58% for LDCT eligible patients and 36% for providers). Although within the range of the previous studies (20–71%) (Lewis et al., 2015; Cataldo, 2016; Klabunde et al., 2012; Zeliadt et al., 2015), response rate bias cannot be excluded. Selection bias should be minimal since respondents and non-respondents had similar characteristics and LDCT adherence rates (Table 3).

5. Conclusion

Based on positive patient attitudes and providers' overall endorsement of LDCT screening at our medical center, we infer that education for providers, shared decision making for eligible patients, and additional counseling for eligible patients who fail to show up for a prescribed CT will increase the accuracy and efficacy of screening within our program. A study of more socio-economically diverse sample populations for patients and providers is warranted to allow for a broader interpretation of these results. These data will ultimately help improve the uptake and utilization of LDCT screening to lower lung cancer mortality in high risk populations.

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Conflicts of interest

None.

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