Changes in Physician Knowledge, Attitudes, Beliefs, and Practices regarding Lung Cancer Screening

To the Editor:

More patients die of lung cancer than breast, colorectal, and prostate cancers combined (1). After the National Lung Screening Trial finding of a 20% relative reduction in mortality of lung cancer with lung cancer screening (LCS) by low-dose computed tomography (LDCT) (2), the U.S. Preventive Services Task Force published recommendations for LCS in high-risk patients (current and former heavy smokers aged 55–80 yr) annually with LDCT (3).

Eligibility for LCS is based on age, pack-years of smoking history, and years since quitting, with reimbursement dependent on physician and patient engagement in shared decision making (SDM). Rates of LCS from 2013 to 2016 were low, ranging from 2% to 7% (4, 5). To understand reasons for low LCS rates, several studies have examined physician attitudes and beliefs regarding screening (6–14). However, these studies were cross-sectional and conducted at a single time point. Isolated snapshots may not accurately reflect provider changes in LCS attitudes and practices. To assess changes in physicians' knowledge, attitudes, and practice patterns regarding LCS over time, we redeployed our 2015 LCS physician opinion survey (6, 15) in 2018 to compare two cross-sectional cohorts of physicians.

Methods

Using the Tailored Design Method, we conducted a Qualtrics survey of physicians in family medicine, internal medicine, and pulmonary medicine at a large academic medical center in the spring of 2015 and in the spring of 2018 (16). We included 23 survey items focused on LCS opinions, knowledge, practices, and perceived barriers. Physicians' LCS opinions were evaluated using a 5-point Likert scale that ranged from strongly agree to strongly disagree. Physicians were asked to rank their opinions on six statements (Figure 1). Physician practice pattern survey questions asked about behaviors in the prior 12 months with response options of yes, no, or don't recall (Figure 2) and a single question about referrals for smoking cessation programs. To ascertain physicians' perceived barriers to LCS, we provided a list of potential barriers (Figure 3) and asked physicians to select all perceived barriers.

We identified physicians through online academic directories and made seven points of contact per the Tailored Design Methodology. Consent was determined by return of the survey. Participating physicians were incentivized with the opportunity to enter into a random drawing for an iPad. This study was approved by the University of North Carolina at Chapel Hill Institutional Review Board (approval no. 13-2672).

Between the two surveys, we implemented a quality improvement project to address key processes required for high-quality LCS implementation (17, 18) and disseminated LCS resources to physicians. We conducted outreach to primary care providers in outpatient clinics, providing written educational materials pertaining to LCS and tobacco treatment as well as demonstrating web-based SDM tools.

We compared responses from physicians in 2015 with those in 2018 using *t* tests for continuous outcomes and chi-square or Fisher's exact tests for categorical outcomes. We accounted for multiple comparisons by adjusting all *P* values using the false discovery rate method (19).

Results

Survey response rates were 40.5% (89 of 220) in 2015 and 30.0% (73 of 243) in 2018. There were no differences in the distribution of age, sex, race, years in clinical practice, or proportion of time spent in outpatient care or in the average number of outpatients seen per week for respondents in 2015 versus 2018. The proportions of respondents in family medicine were 41.6% in 2015 and 43.8% in 2018; in internal medicine, they were 39.5% in 2015 and 39.3% in 2018; and in pulmonary medicine, they were 19.1% in 2015 and 16.4% in 2018. Over time, there was an increase in the proportion of physicians who reported LCS as beneficial (47.7% vs. 77.2%; adjusted $P < 0.01$) (Figure 1). In both years, approximately half of respondents were undecided on the cost effectiveness of LCS (56.3% and 48.6%, respectively; adjusted $P = 0.09$), and most of the respondents believed they had enough knowledge to explain the pros and cons of LCS (64.7% in 2015 and 75.7% in 2018; adjusted $P = 0.49$). Approximately two-thirds of physicians cited time restrictions during the patient's clinic visit and other problems having higher priority than LCS (62.3% in 2015 and 70.0% in 2018; adjusted $P = 0.49$).

Over the 3 years between 2015 and 2018, the proportion of physicians who reported initiating LCS discussions increased from 45.9% to 87.3% (adjusted $P = 0.03$), and the proportion who reported ordering an LCS examination more than doubled (from 32.2% to 74.6%; adjusted $P = 0.02$) (Figure 2). The proportion of physicians who referred a patient to another provider for LCS evaluation also increased (12.9% in 2015 vs. 29.9% in 2018; adjusted $P = 0.03$).

The proportion of physicians who reported any barrier to LCS was similar: 89.9% in 2015 and 86.3% in 2018 (Figure 3). Although many physician-reported barriers to LCS remained constant over time, fewer physicians reported lack of evidence (adjusted $P = 0.05$) or patient cost (adjusted $P = 0.03$) as a barrier in 2018 than in 2015.

Discussion

We found significant increases between 2015 and 2018 in the proportion of physicians who reported initiating a discussion about LCS, ordering LDCT for LCS, discussing LDCT results, and referring patients for further evaluation. In contrast, physicians

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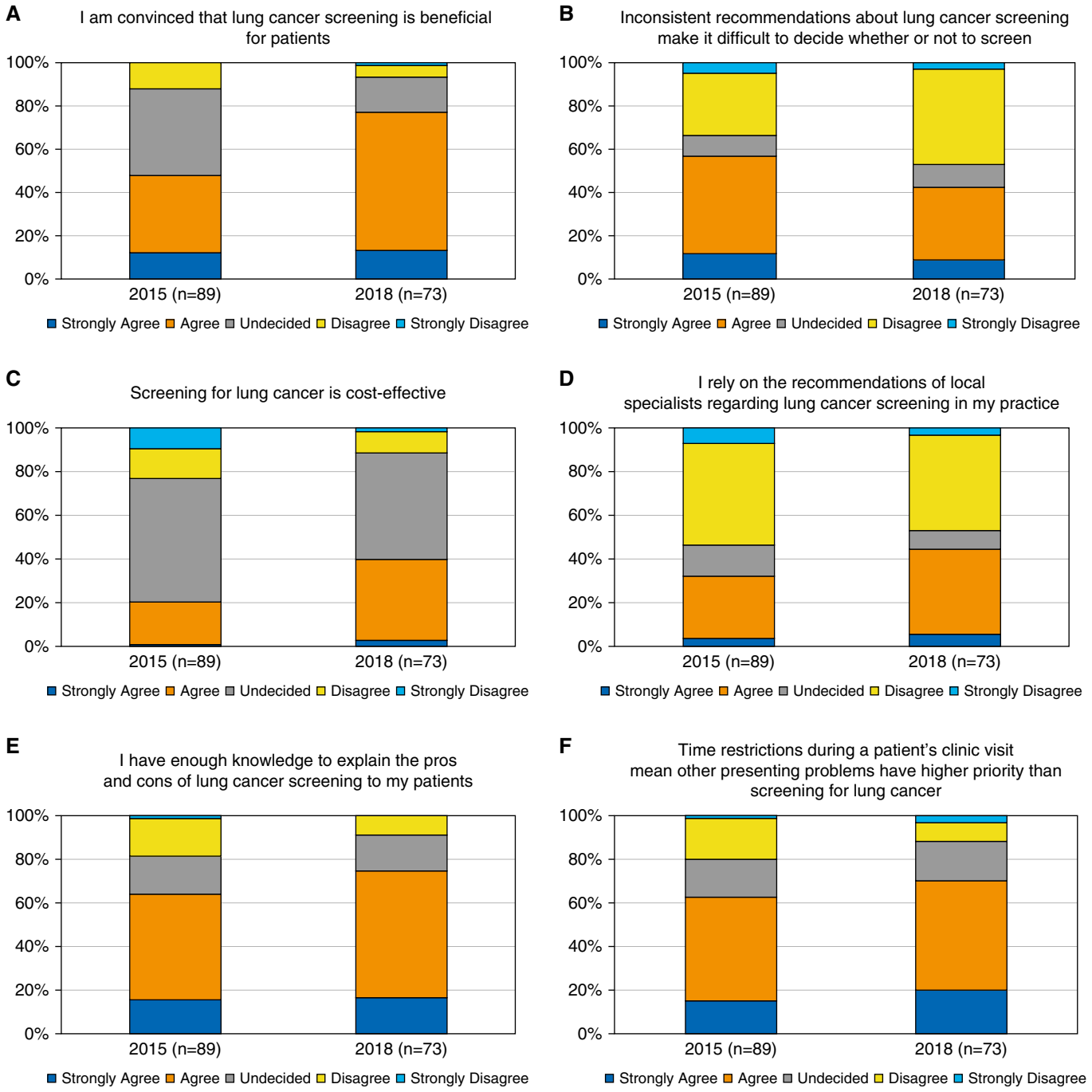

Figure 1. (*A–F*) Comparison of physicians' lung cancer screening opinion statements from 2015 and 2018.

reported a similar proportion of patients asking about LCS, suggesting that physicians have gained knowledge and experience in LCS, whereas patients' knowledge regarding LCS has not changed. This is an area for future investigation.

According to physician respondents, barriers to LCS remain a concern, with few barriers decreasing over time. Other studies reported similar barriers at a single time point (9, 10, 12, 13, 20–22). Because of the complexities of LCS, physicians find it increasingly challenging to allocate their already limited time and resources to incorporate the necessary and required components of LCS (patient eligibility assessment, benefit and risk discussion coupled with SDM, and discussion/referral/treatment for tobacco addiction) into daily practice. To accomplish widespread acceptance of LCS, physician education and system-level changes are required (23, 24).

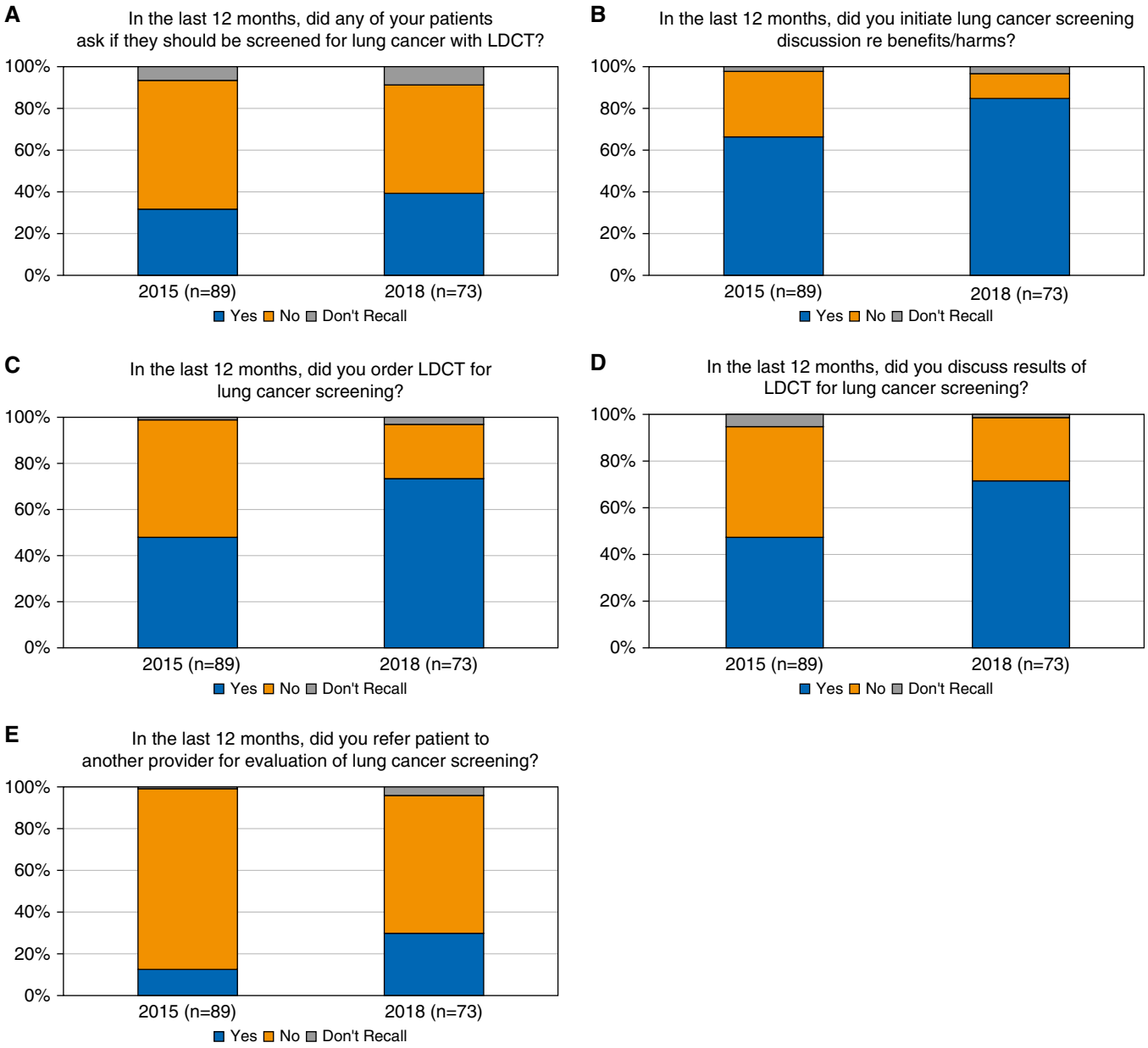

Figure 2. (*A–E*) Lung cancer screening practice statements from 2015 and 2018. LDCT = low-dose computed tomography.

Our survey was implemented using the Tailored Design Method, a standard survey methodology that is rigorous in terms of survey design and deployment. Our response rates are similar to those for other nonspecialty physician surveys focused on LCS (range from 7% to 53% [7, 9, 11, 13, 20, 22, 25]), although our sample sizes are modest. It is possible that attitudes and practice patterns at our single site may not represent national patterns.

We found that physicians view LCS as more beneficial and were more likely to order LDCT for LCS in 2018 than in 2015; however, physicians continued to have concerns regarding time restrictions and other barriers to LCS. This research has implications for continued adoption and dissemination of LCS into practice. As LCS continues to gain momentum in the United States and with preliminary results of the Nelson Lung Cancer Screening Trial favoring LCS (26), identifying and addressing barriers to LCS are needed.

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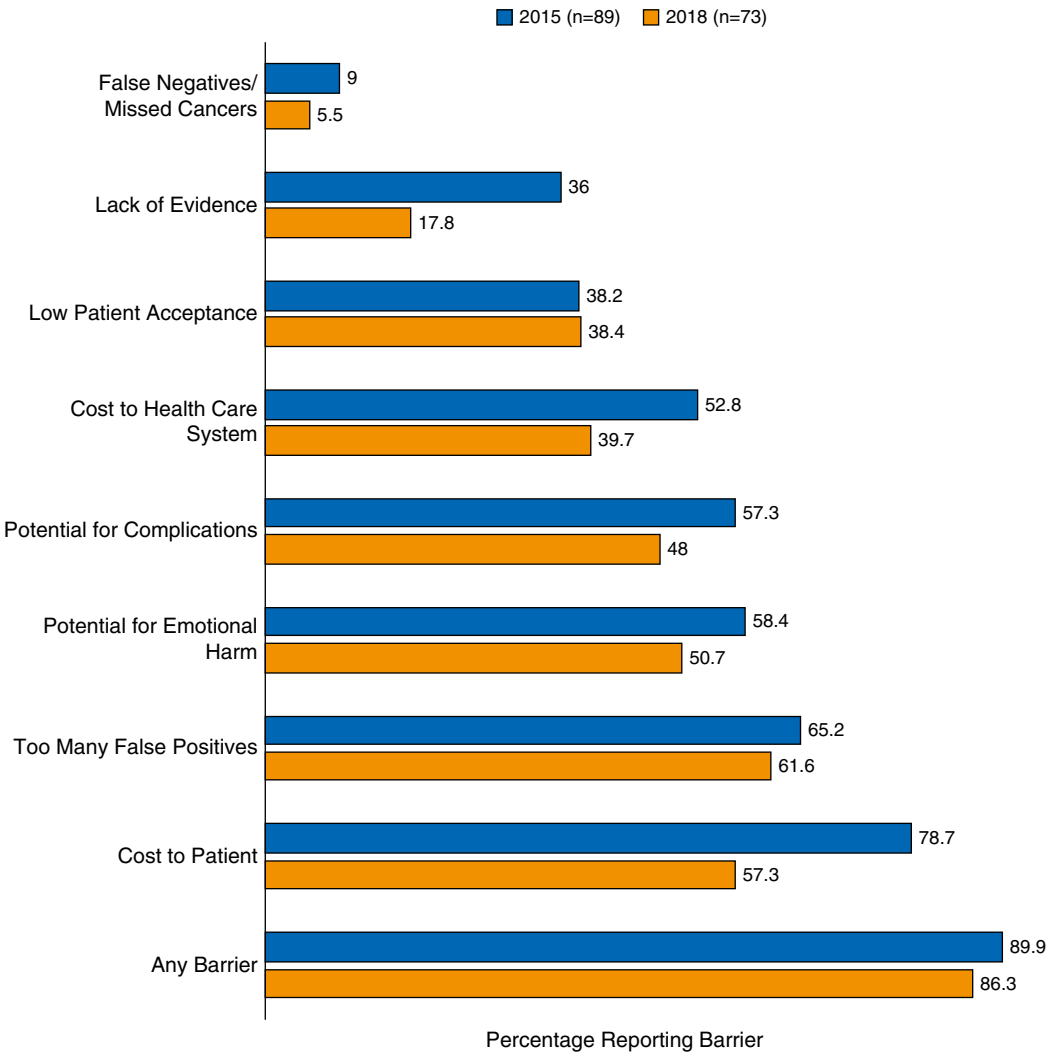

Figure 3. Physician-reported barriers to lung cancer screening in 2015 versus 2018.

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Influence of County Sampling on Past Estimates of Latent Tuberculosis Infection Prevalence

To the Editor:

The National Health and Nutrition Examination Survey (NHANES) has tested for *Mycobacterium tuberculosis* infection three times: in 1971–1972, 1999–2000, and 2011–2012. Based on tuberculin skin test results, the estimated national prevalence of latent tuberculosis infection (LTBI) among adults was 11–18% in 1971–1972 but has remained less than or equal to 6% in subsequent NHANES cycles (1–4). A single 2-year NHANES cycle is designed to produce accurate and stable estimates for conditions with at least 10% prevalence in the noninstitutionalized civilian U.S. population (5–7), suggesting that NHANES might no longer be as nationally representative for LTBI as it is for more common health conditions. Approximately 30 counties were selected for each 2-year cycle (5). We wished to examine whether persons in selected counties might have been systematically more or less likely to have a positive tuberculin skin test result than their counterparts in the approximately 3,100 counties that were not selected for NHANES participation.

Methods

We created a non-NHANES dataset with demographic profiles and tuberculosis data for all 3,143 U.S. county equivalents (Table 1). The U.S. Census Bureau and Department of Agriculture websites provided each county's population size and racial/ethnic composition, rural versus urban classification, and poverty prevalence for 1970 through 2013. The National Tuberculosis Surveillance System provided annual tuberculosis disease incidence, with the U.S. Census Bureau's Current Population Survey providing county population denominators.

We also used genotyping results to derive an estimate of LTBI prevalence for each county. Briefly, this simple back-calculation method assumed that tuberculosis cases not attributed to recent transmission (i.e., based on genotyping results) instead arose from preexisting LTBI. Then a 0.1% annual risk of reactivation was used to derive an estimated number of county residents with untreated longstanding LTBI (8). This county-level LTBI estimation method has not been

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Author Contributions: M.B.H. conceptualized the analysis, and all of the authors contributed to its design. M.B.H. and K.M.R. created the non–National Health and Nutrition Examination Survey county-level dataset. M.B.H. executed the analysis and prepared the first draft of the article within the National Center for Health Statistics Research Data Center. All of the authors provided critical revisions and approved the final version of the manuscript.