

Physicians' Knowledge and Practice of Lung Cancer Screening: A Cross-Sectional Survey Comparing General Practitioners, Thoracic Oncologists, and Pulmonologists in France

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Abstract

Physicians' actual knowledge and practice of lung cancer screening in routine practice are poorly known. We conducted a survey in 242 French physicians. The usefulness of low-dose computed tomography was poorly known by 82% of general physicians compared with 19% of thoracic oncologists and 48% of pulmonologists. However, approximately one third of them routinely propose a screening test, stressing the need for better education on this topic.

Background: Screening for lung cancer by low-dose computed tomography scan (LDCTS) has been demonstrated to reduce lung cancer-specific and overall mortality rates in high-risk individuals. From trial to clinical practice, it is crucial to obtain an accurate level of knowledge of the physicians who will recruit patients for a screening program. The actual current practice and knowledge of practitioners are unknown. This could be critical to develop dedicated continuous medical education programs. **Materials and Methods:** Three groups of French physicians—pulmonologists (PUs), thoracic oncologists (TOs), and general practitioners (GPs)—were surveyed through a dedicated questionnaire on lung cancer screening. **Results:** A total of 242 physicians answered the questionnaire; 81% of TOs knew that LDCTS showed efficacy for screening lung cancer compared with 52% of PUs and 18% of GPs ($P < .0001$). Approximately one third of physicians recommended lung cancer screening in daily practice at the time of the survey, including 53% of PUs, 34% of TOs, and 20% of GPs ($P < .001$). However, 94% of GPs, 44% of PUs, and 33% of TOs used inappropriate tests, mainly chest radiography. Most GPs proposed screening for all smokers, whereas PUs and TOs reserved screening for heavy smokers ($P = .040$). Most PUs and TOs recommended annual LDCTS (76%), whereas the majority of GPs sent patients for screening tests every 3 to 5 years (93%; $P < .0001$). **Conclusions:** These results highlight the interest of physicians for lung cancer screening; meanwhile, our data stress the need for appropriate medical education and recommendations based on available evidence.

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Introduction

Lung cancer is the leading cause of cancer-related mortality in developed countries. Lung cancer is diagnosed at an advanced or metastatic stage in the majority of patients, and the therapeutic strategy is then considered palliative.¹ By contrast, early-stage tumors may benefit from curative-intent treatment, which is associated with an excellent prognosis.^{2,3} Consequently, patients with lung cancer may benefit from screening, according to the World Health Organization criteria. Recent results from the National Lung Screening Trial (NLST) showed that annual low-dose computed tomography scan (LDCTS) decreased lung cancer-related mortality by 20% and overall mortality by 7% compared with annual chest x-ray in selected individuals (up to 55 years of age and < 75 years of age, current or former smokers who have quit for < 15 years and have a total consumption of > 30 pack-years).⁴ At the same time, the Prostate Lung Colorectal Ovarian study showed that screening using chest radiography did not reduce lung cancer mortality when compared with usual care.⁵ After the NLST, several academic groups elaborated guidelines⁶ or statements about lung cancer screening in the United States⁷ and in Europe.⁸ Emphasis was placed on the potential benefits of screening using annual LDCTS. These groups underlined the necessity of following experts' recommendations for screening modalities and fully informing individuals about the benefits and potential risks.

Screening programs rely on the accurate knowledge and understanding of participating physicians, especially primary care physicians, such as pulmonologists (PUs) and general practitioners (GPs).⁹ In France, assessing the practice and knowledge of such physicians is particularly important, because the French randomized trial evaluating lung cancer screening using LDCTS failed in part because of major difficulties encountered by the inclusion process that was mostly based on GPs.¹⁰

Our study aims to assess the current practice and knowledge of three different groups of physicians potentially implicated in lung cancer screening: GPs, PUs and thoracic oncologists (TOs).

Materials and Methods

This study was conducted in the Rhône-Alpes and Auvergne regions in France by the Lyon Lung Cancer Screening Working Group. This multidisciplinary group was created in June of 2012. It includes representatives of the university department of pulmonology and radiology, GP organizations, statisticians, methodologists, epidemiologists, and economists. The aim of the group is to create a multidisciplinary network to develop studies about lung cancer screening.

Questionnaire

A standardized questionnaire was created by the multidisciplinary group. It includes 12 questions. Most of them have with only one answer expected (Online Fig. 1). Three questions aimed at characterizing the physician profile: certification, practice type (private or public), and history. Other questions were about lung cancer screening; including methodology issues: "In your opinion, what is the best efficacy end point of a cancer screening program?" with the following choices: "increased incidence of early-stage lung cancer," "increased quality of life of individuals," "decreased lung cancer mortality," or "decreased overall mortality,"; and the results of

screening studies: "Do you know about an efficient way to screen lung cancer?" with the following possible choices: "no," "sputum examination," "chest radiograph," "LDCTS (no contrast)," or "contrast-enhanced LDCTS." Participants were asked about their current practice on screening, including their target population, the tests they used, and the guidelines they followed. All physicians were asked about their opinion on the benefit of a tobacco-control program associated with a lung cancer screening program.

Population

GPs were surveyed during the most attended Continuous Medical Education meetings in the Rhône-Alpes region (Actualités Claude Bernard organized by Lyon 1 University). PUs were tested during the annual meeting of the Regional Respiratory Medicine Society. TOs were invited to participate in this study during the annual meeting for regional practice guidelines updating, organized by the Regional Cancer Network. All of these meetings occurred in October and November of 2012. The survey was distributed to each participant as a part of welcome-packs. All participants were informed of the study objectives and subsequently asked to participate by the organizers during the opening sessions of the meetings. Questionnaires were then collected during the meeting and before the lung cancer screening session if appropriate (PU and TO meetings). Physicians' consent for analyzing, reporting, and publishing their questionnaire was obtained by ticking a box on the survey sheet.

A total of 242 questionnaires were available for analysis: 155 in the GP group (35% of the 448 physicians registered for the meeting), 52 in the PU group (43% of the 120 registered physicians), and 37 in the TO group (71% of 52 registered physicians). Two participants did not give their consent by ticking the corresponding box (Fig. 1).

Statistical Analysis

Statistical analysis was performed with SPSS version 19 (IBM Corp., New York, NY). Chi-square and 2-sided exact Fischer tests were used as appropriate for comparing proportion of qualitative variables. Analysis of variance was used for comparing numeric variables. A $P < .05$ was considered significant.

Results

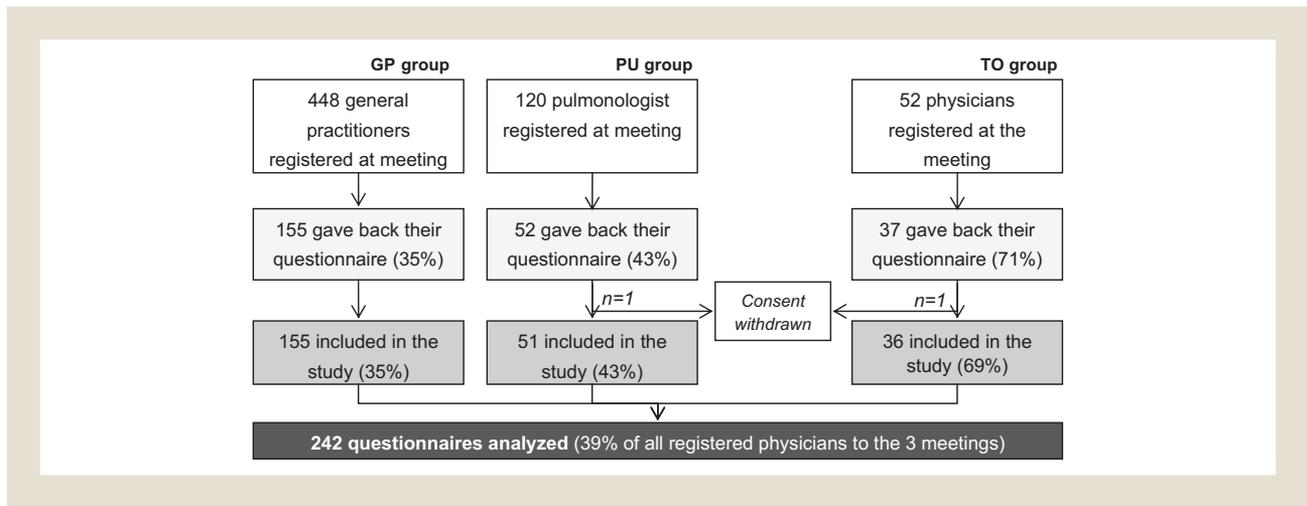
The main characteristics of the population are summarized in Table 1. There were strong differences ($P < .0001$) among the 3 groups in the type of certification and years of exercise. There was no significant difference among the 3 groups in the duration of exercise ($P = .069$).

Screening Methodology: End Points

Most GPs (50%) believed that the best indicator for assessing a screening program was "increased incidence of early-stage lung cancer" compared with 34% and 45% of TOs and PUs, respectively (Table 2 and Fig. 2). TOs and PUs indicated that the best end point should be "decreased lung cancer or overall mortality" (66% and 53%, respectively). The difference between "increased rate of early stage or quality of life" and "decreased overall or lung cancer mortality" was not significant for the 3 groups (Fig. 2A). However, if the PUs and TOs are pooled, 58% of physicians in the

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Figure 1 Flow Chart of the Study



Abbreviations: GP = general practitioner; PU = pulmonologist; TO = thoracic oncologist.

Table 1 Main Characteristics of the Three Groups of Physicians Surveyed

	PU Group (n = 51)		TO Group (n = 36)		GP Group (n = 155)		Total (n = 242)	
Certification								
PU	50	98%	28	78%			78	32%
GP					146	94%	146	60%
Other	1	2%	8	22%	9	6%	18	8%
Years of Practice (Mean ± SD)^a	17 (±13)		13 (±11)		19 (±12)		17 (±12)	
Type of Practice								
Private	14	27%	4	11%	133	86%	151	63%
Public hospital	30	59%	26	72%	1	1%	57	24%
Other, mixed, and missing	7	14%	6	17%	21	13%	34	14%

Abbreviations: GP = general practitioner; PU = pulmonologist; SD = standard deviation; TO = thoracic oncologist.

^aResidents were considered with a null experience (n = 12).

“PU + TO” groups considered that decreasing mortality (overall and specific) was the best indicator versus 44% in the GP group ($P = .049$). Few physicians answered the “increased quality of life” item.

Screening Methodology: Tests

More than 80% of TOs were aware that LDCTS (no contrast) has been demonstrated to be efficient for lung cancer screening, whereas only 52% of PUs and 18% of GPs reported this ($P < .0001$; Fig. 2B); 48% of GPs considered that there was no efficient strategy for screening lung cancer.

Although few participants mentioned sputum examination as an efficient test, 10% of GPs still considered chest radiography and 22% of PUs and 20% of GPs considered contrast-enhanced LDCT as efficient strategies for lung cancer screening (Table 2).

Screening Practices

At the time of the survey, one third of participants (n = 70) were proposing screening to their patients in daily practice. These included most of the PUs (53%) followed by TOs (34%) and GPs

(20%; $P < .001$; Fig. 2C). Of those, 93% of GPs, 44% of PUs, and 33% of TOs used an inappropriate test, mainly chest radiography (Table 2).

Practitioners who answered that they proposed a screening for lung cancer at time of the questionnaire (27 PUs, 12 TOs, and 31 GPs) were all surveyed about their target population. PUs and TOs were pooled to have sufficient effective for comparisons. Table 3 summarizes the answers to these questions. Five physicians did not answer. Most GPs proposed screening to all smokers irrespectively of the number of pack-years (55%), whereas PUs and TOs considered it for heavy smokers (33% and 42% for smokers up to 20 and 30 pack-years, respectively; $P = .040$). In regard to age limits for starting and stopping the screening period, there was little difference among the 3 groups. Most GPs began the screening period earlier than PUs and TOs. More than 50% in each group pursued screening up to 75 years, and 31% of PUs + TOs and 25% of GPs never stopped it. Finally, there was a strong difference between GPs and PUs + TOs with regard to screening test time interval. Most PUs and TOs proposed a test each year (76%), whereas the majority of GPs proposed it every 3 to 5 years (93%; $P < .0001$).

Table 2 Physicians' Knowledge and Practice of Screening: Complete Answer to the Questionnaire

	PU Group (n = 51)		TO Group (n = 36)		GP Group (n = 151)		Total (n = 242)	
Q4: What is the best efficacy end point of a cancer screening program?								
Increased incidence of early-stage lung cancer	22	45%	12	34%	74	50%	108	46%
Increased quality of life of individuals	1	2%	—	—	9	6,0%	10	4%
Decreased lung cancer mortality	20	41%	19	54%	41	27%	80	34%
Decreased overall mortality	6	12%	4	11%	25	17%	35	15%
Q5: Do you know about an efficient way to screen lung cancer?								
No	10	20%	3	8%	74	48%	87	36%
Sputum examination	1	2%	—	—	4	3%	5	2%
Chest radiography	2	4%	1	3%	16	10%	19	8%
LDCTS (no contrast)	26	52%	29	81%	28	18%	83	35%
Contrast-enhanced LDCTS	11	22%	3	8%	31	20%	45	19%
Q6: What is your current practice of lung cancer screening (asymptomatic patient)?								
No screening	24	47%	23	66%	123	80%	170	71%
Sputum examination	2	4%	—	—	—	—	2	1%
Chest radiography	11	22%	4	11%	27	17%	42	17%
LDCTS (no contrast)	12	23%	8	23%	2	1%	22	9%
Contrast-enhanced LDCTS	2	4%	—	—	2	1%	4	2%
Q10: Do you think that a screening program for lung cancer should be associated with a tobacco control program?								
Absolutely not	—	—	—	—	1	1%	1	0%
Not necessarily	2	4%	3	9%	30	20%	35	15%
If possible	8	16%	2	6%	41	27%	51	22%
Yes, absolutely	41	80%	30	86%	78	52%	149	63%

Bold values represent the expected answer(s).

Abbreviations: LDCTS = low-dose computed tomography scan; GP = general practitioner; PU = pulmonologist; TO = thoracic oncologist.

Tobacco Control and Guidelines

The majority (63%) of surveyed physicians consider that tobacco control should absolutely be associated with lung cancer screening program. Nevertheless, 21% of GPs reported that it could be “absolutely not or not necessarily” proposed, compared with 9% and 4% of TOs and PUs, respectively ($P < .0001$; Table 2 and Fig. 2D). Sixty percent of TOs knew that some guidelines or statements have been published, compared with 35% of GPs and 51% of PUs. Among physicians who knew such guidelines (58% overall), only 13% thought these may originate from European, outside France, or American societies, and only 3% thought these may be French.

Discussion

This study consisted of a questionnaire administered to 242 physicians, including 51 PUs, 36 TOs, and 151 GPs. The results highlight 2 important facts. First, screening for lung cancer is poorly known or understood by primary care physicians because 46% overall considered “increasing incidence of early stages lung cancer” as the best efficacy end point of a screening program, and 65% overall did not know an efficient screening test or gave credit to an inappropriate test (chest radiograph mainly). Second, lung cancer

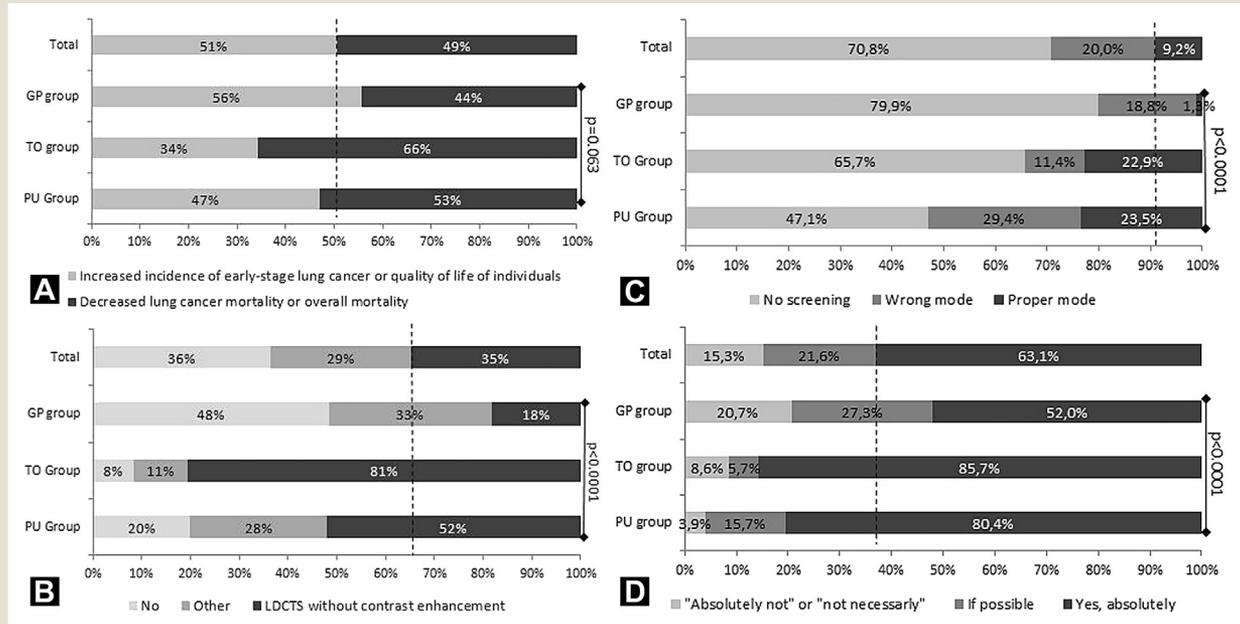
screening has already been in use in routine medical practice because one third of surveyed physicians proposed screening to their patients. Most PUs proposed systematic screening, as well as one third of TOs. Only 20% of GPs performed systematic screening, and the majority prescribed an inappropriate test or did not target the accurate population, on the basis of current evidence.

Our study has several biases related to its methodology. First, there was a selection bias of the population. The physicians who answered were probably those particularly interested in this topic. Nonetheless, it is difficult to know how this may have affected the results. The responding rate could be interpreted as reflecting the interest of the different groups of physicians for this topic. The GPs showed a poor rate (35%), whereas the TOs showed a higher rate (71%). Second, the total sample size is low. Although the study produced statistically significant differences and was comparable to similar published work, it cannot be generalized across a country or specialty group. Last, the study may have self-reporting and interpretation biases that may be difficult to assess.¹¹

Our study shows that there is currently a great imbalance in the knowledge of existing efficient strategy for screening lung cancer. Although TOs are well informed about the efficacy of LDCTS, fewer GPs and PUs are informed. Moreover, around 20% of GPs

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Figure 2 Physician Knowledge and Practice of Lung Cancer Screening: Summarized Answers. *Dotted Line Shows the Cutoff Value of the More Relevant Indicator and for the Whole Panel.* A, Answer to the Question "What is the Best Efficacy End Point of a Cancer Screening Program?" B, Answer to the Question "Do you Know About an Efficient Way to Screen Lung Cancer?" The "Other" Class Includes "Sputum Examination," "Chest Radiograph" and "Contrast-Enhanced LDCTS." C, Answers to the Question "What is Your Current Practice of Lung Cancer Screening (Asymptomatic Patient)?" Wrong Mode Includes Sputum Examination, Chest Radiography, and Contrast-Enhanced LDCTS. Proper Mode is LDCTS (no Contrast). D, Answers to the Question "Do you Think That a Screening Program for Lung Cancer Should be Associated With a Tobacco Control Program?"



Abbreviations: LDCTS = low-dose computed tomography scan; GP = general practitioner; PU = pulmonologist; TO = thoracic oncologist.

and PUs are not aware of screening CT scan's setting. These observations may be critical because these 2 groups of physicians are mainly those who would be involved in screening prescription.

However, evidences on lung cancer screening are new since the NLST study (which gave the most relevant evidence) was reported in 2010 and published in 2011. There is usually a latency period between the date of evidence publishing and the date of implementation in general practice. Thus, first articles in the French specialized press for GPs date from 2012 only.¹²⁻¹⁵ Moreover, no Continuing Medical Education session on this topic had been organized yet in our region before this survey.

Our study stresses an urgent education need because screening is already part of routine practice. Our work showed that one third of questioned doctors were prescribing lung cancer screening. However, the type of screening test and its modalities were not relevant. Although chest radiography is thought to be an efficient strategy by 4% and 10% of PUs and GPs, respectively, 22% and 17% of them, respectively, used this test in daily practice for screening purpose. Moreover, modalities of screening were not fully understood by participants of the survey. Indeed, lung cancer screening shows efficacy in only specific conditions. Although guidelines could slightly differ,⁶⁻⁸ they all define a matrix for selecting a high-risk population in whom screening should be efficient. Our survey shows that in half of the cases, GPs screened any smoker. Pack-years is probably not the sole indicator that could be used for selecting individuals,^{16,17} but no other criterion has been reported so far. Our

work also emphasizes some irrelevance in the frequency of prescription of screening tests. All published studies showed that lung cancers were diagnosed at every round of CT scan, even if the screening period is increased.^{4,18,19} Moreover, an Italian trial aimed to determine the best frequency between annual or biennial screening. This study failed to demonstrate any superiority of one arm over the other.²⁰ Consequently, screening every 3 or 5 years could lead to a loss of chance. These results should prompt policy leaders to carefully regulate the prescription of screening tests for lung cancer through practice guidelines or reimbursement limitation.

In a recent article,⁹ 297 physicians were asked to choose between 2 scenarios of 2 different hypothetical screening tests: One was described as improving 5-year survival and increasing early detection, and the other was described as decreasing cancer mortality and increasing cancer incidence. Groups were randomized for order effect.⁹ This study reported similar results as ours: More physicians were inclined to choose the first scenario, which was not the most relevant one. In another study, the current practice of American physicians was indirectly assessed through the 2010 National Health Interview Survey. This survey was conducted by the National Institutes of Health on > 15,000 individuals. Twenty-three percent of surveyed subjects reported that they had undergone chest radiography during the previous year; in 2.5%, this examination was only motivated for a lung cancer screening purpose. Corresponding rates for CT scan were 7.5% and 1.3%, respectively.

Table 3 Population Selection and Frequency of Tests According to Physicians Who Propose Lung Cancer Screening

	PU and TO Group (n = 37)		GP Group (n = 28)		Total		P Value
Tobacco Status							
Other ^a	9	25%	16	55%	25	39%	
Current and former smoker up to 20 pack-years	12	33%	7	24%	19	29%	.040
Current and former smoker up to 30 pack-years	15	42%	6	21%	21	32%	
Starting Age							
Other ^b	8	22%	7	25%	15	23%	
> 50 years	18	49%	17	61%	35	54%	.340
> 55 years	11	30%	4	14%	15	23%	
Ending Age							
Never	11	31%	5	25%	16	29%	.560
< 70 years	4	11%	5	25%	9	16%	
< 75 years	13	37%	5	25%	18	33%	
< 80 years	7	20%	5	25%	12	22%	
Interval Between 2 Tests							
Every year	29	76%	2	7%	31	48%	< .0001
Every 3 or 5 years	9	24%	25	93%	34	52%	

Abbreviations: GP = general practitioner; PU = pulmonologist; TO = thoracic oncologist.

^aOther answers were "all former and current smokers" or "none of the proposed answer."

^bOther answers were "> 65 y old" or "none of proposed."

These findings indicate that lung cancer screening is currently practiced in the United States, although less expanded than we showed in our work, probably because of health system differences.²¹ In 2010, the French National Cancer Institute promoted a survey on cancer screening knowledge and practice (lung cancer excluded) of GPs.²² A total of 600 physicians were questioned. More than 70% reported to be convinced of screening efficacy overall (except for prostate cancer), and 60% of GPs were convinced, although they should have a pivotal role in cancer screening (except for cervix cancer). Of note, GPs considered that the false-positive rate is a critical point in cancer screening and many of them pay little attention to overdiagnosis bias. Only 19% of GPs answered that they always checked the breast, cervix, and colon cancer screening status for each patient. The study also showed that there was no correlation between perceived efficacy of a cancer screening test and personal opinion or practice. These observations confirm our results and emphasize future challenges for lung cancer screening.

Conclusion

Our study provides a semiquantitative approach of knowledge and routine practice of different physicians involved in lung cancer screening. Our results may be helpful for implementing education in that field. Our results stress the need for better medical education on that topic, especially because many physicians already use lung cancer screening in their daily practice. In that context, a multidisciplinary network including primary care physicians may be an interesting tool for using the results of clinical trials in routine practice.

Clinical Practice Points

- Patients with lung cancer may benefit from screening according to the World Health Organization criteria.

- Annual LDCTS was shown to decrease lung cancer-specific mortality by 20% and overall mortality in selected patients in a randomized controlled trial in which the control arm had an annual chest radiograph.
- Another randomized trial showed that an annual chest radiograph did not show benefits in individuals compared with usual care for a screening purpose.
- After this study, many academics, including French ones, have provided guidelines or statements emphasizing the potential benefits of screening using annual LDCTS.
- Knowledge of involved physicians, such as PUs, TOs, and GPs, and their current practice of lung cancer screening remain unknown.
- Although most TOs (81%) were aware of the usefulness of LDCTS, most GPs and some PUs were not (82% and 48%, respectively).
- One third of surveyed physicians currently propose a lung cancer screening test in daily practice (half of PUs, one third of TOs, and 20% of GPs).
- Ninety-four percent of those who currently propose a screening test use an inappropriate test (mainly chest x-ray). Moreover, the recommended selection criteria of the eligible population (i.e., aged 55-74 years, smoke more than 30 pack-years, quit < 15 years ago if former smoker, among others) are not followed in most cases.
- Our results stress the need for better education on that topic, particularly for GPs.
- This study may be helpful for policy makers because it gives a cross-sectional view of the knowledge and practice before the dissemination of lung cancer screening guidelines among primary care physicians.

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Supplementary Data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.clcc.2013.05.003>.

Disclosure

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