OPINION

Lung cancer screening in Lebanon: Joint statement from the Lebanese Pulmonary Society and the Lebanese Society of Medical Oncology

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Abstract. Lung cancer is the leading cause of cancer mortality worldwide. The 5-year survival rate of patients is ~15%, since the majority of patients present with the disease at an advanced stage. The resulting burden from this disease entails solid efforts towards early detection and smoking cessation. In Lebanon, the triad of high incidence and mortality from lung cancer, extensive tobacco consumption and delayed diagnosis calls for urgent actions. Furthermore, lung cancer screening with a low-dose computed tomography (CT) scan allows for the early detection and reduces mortality rates, as documented in several randomized trials and meta-analyses and recommended by international relevant societies. A panel of Lebanese lung cancer experts, members of the Lebanese Society of Medical Oncology and the Lebanese Pulmonary Society, have convened and discussed all aspects and challenges related to lung cancer screening implementation in Lebanon. Accordingly, national guidelines were proposed in this joint statement, which defines the particular high-risk population that would most benefit from screening. Pillars to success involve a solid, evidence-based national program, efficient smoking cessation programs and proper referral and follow-up. In parallel, the quality and logistical basic requirements must be optimized with well-equipped centers, trained personnel and expert radiologists; in addition to promoting awareness, adherence and sustainability. Physicians need to be trained to ensure accurate risk stratification for the screening and proper referrals from different specialties. Awareness should also be raised in the general population on the safety and benefits of low-dose CT, and to encourage smoking cessation via dedicated programs. In a country where the economic situation is challenging, and where third-party payers are resistant to cover screening initiatives, support from the Lebanese Ministry of Public Health is warranted, along with a cost-effectiveness analysis to uncover the elevated cost of treating advanced stage lung cancer.

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Introduction

Lung cancer rates second in incidence, but first as a cause of cancer-related mortality worldwide and in the United States (1,2). In 2020, ~2.2 million new cases were diagnosed worldwide and 1.8 million deaths occurred with a mortality-to-incidence ratio of 0.82 (2). The 5-year survival rate of patients with lung cancer was 56% in 2015 for cases detected when the disease was still localized. However, only 16% of lung cancer cases are diagnosed at an early stage (3). This leads to only 15% of patients with lung cancer remaining alive at 5 years, since 70% already

present with advanced stages of the diseases at the time of diagnosis (4).

Accordingly, in order to decrease the burden of lung cancer, solid efforts need to be made towards the early detection and smoking cessation in addition to the optimization of management. In fact, trends towards a decrease in lung cancer incidence have been noted in the United States between 2009 and 2018 (by 1 and 3% annually for females and males, respectively) (1). Recently, it was shown that the incidence has even been steeply declining further for advanced-stage disease, while rates for localized-stage disease increased suddenly by 4.5% annually (1). This decline coincides and mirrors the decrease in smoking rates in addition to the increase in lung cancer screening. In Lebanon, lung cancer ranks second in incidence following breast cancer, accounting for 9.2% of all cancer cases reported between 2005 and 2015, mostly among patients >50 years of age (89.2%) (5). This is attributed to the high prevalence of smoking, air pollution, exposure to asbestos and other carcinogens, and family history. A recent study revealed that lung cancer represents 8% of all cancer cases (11.4% in males; 5.1% in females) and ranks second after breast cancer, with smoking again being the essential risk factor (6). In fact, the rates of tobacco smoking in Lebanon were reported in a study published in 2017; the findings of that study reported a high incidence of 50.3% among males and 34.1% among females, ranking second and first in the Middle East and North Africa region, respectively (7). Moreover, in line with the global trend, close to 60% of lung cancer cases in Lebanon are stage IV, and only 12% stage IA (8). Unfortunately, patients diagnosed with a distant metastatic disease (stage IV) have a 1-year survival rate of around 20% compared to 81-85% for stage I (9).

In addition, Lebanon is a low-income country with increasing rates of poverty, and recent dramatic decreases in access to medical care and to optimal management pathways. This translates into increasing late presentations of patients and the late diagnosis of diseases, with limited options of treatment, as well as the absence of a proper primary care set-up.

Hence, the expanding triad of high incidence and mortality rates of lung cancer, high tobacco consumption and delayed diagnosis suggests that there is an urgent need for smoking cessation and lung cancer screening programs to be rapidly implemented on the national level. In that perspective, the objectives of the present consensus were to review the current burden of lung cancer in Lebanon, to identify the gaps in achieving early detection, and to set local recommendations for lung cancer screening.

Drawing of recommendations and review of evidence

A panel of experts, including members of the Lebanese Society of Medical Oncology (LSMO) and the Lebanese Pulmonary Society (LPS) convened and discussed all aspects and challenges related to lung cancer screening in Lebanon. International guidelines and important trials were presented and discussed, as well as worldwide implementation strategies. Accordingly, national guidelines were set, as well as implementation recommendations, taking into consideration the obstacles and challenges that may be faced. A voting system was used to draw recommendations.

For the review of the evidence and the international guidelines presentation, and to ensure that the recommendations were evidence-based, a systematic literature review of the studies and guidelines published between January, 2010 and 2022, was carried out using the Medline and EMBASE databases. Global recommendations and literature-based latest medical evidence are also displayed in this joint statement.

Lung cancer screening in global practice

The importance of lung cancer screening has been demonstrated in several randomized trials and has resulted in a significant decrease in mortality in the screened high-risk populations and is currently uniformly acknowledged (10-12). To date, the only recommended screening tool for that purpose is low-dose computed tomography (CT); It has been shown to have high sensitivity and acceptable specificity for the detection of lung cancer and its adoption at specific intervals in high-risk individuals leads to a decrease in lung cancer-related mortality (10-12). Various other modalities and combinations of tests are not recommended, as they have not been shown to be beneficial or lack standardization, including chest radiographies, genomics, biomarkers and sputum cytology (13). Of note, some population-based cohort studies have underlined the effectiveness of chest radiographies in detecting early lung lesions and in reducing the mortality rate of patients with lung cancer (14-16). Additionally, in view of the evolution of artificial intelligence in powering readings (17), there is a need for further pilot studies for evaluation, since chest radiographies are low in cost, readily available and are performed in high numbers.

The two largest trials supporting the use of a low-dose CT scan for screening are the 2011 National Lung Screening Trial (NLST) and the 2020 NELSON studies (10,12). These two large studies randomized 53,454 and 15,822 individuals who were at a high-risk of developing lung cancer, respectively and compared screening by a low-dose CT scan versus screening by chest radiography (annually for 3 years) in the first one and to no screening in the NELSON trial. They defined high risk according to age and smoking history. There was a 20% reduction in mortality from lung cancer and 6.7% fewer all-cause deaths, in the low-dose CT scan group compared to the radiography group in the NSLT study (10). In the NELSON study, at the 10-year data point, lung cancer was diagnosed in 5.58 cases per 1,000 person-years in the low-dose CT scan screening group versus 4.91 cases per 1,000 person-years in the control group. Lung cancer mortality was 2.50 deaths per 1,000 person-years in the low-dose CT scan screening group, lower than the 3.30 deaths per 1,000 person-years in the control group (12).

In the NLST trial, screening identified a predominance of lung adenocarcinoma. In both the low-dose CT scan and the radiography groups, a large number of adenocarcinomas and squamous-cell carcinomas were detected at either stage I or stage II, while small-cell lung cancer lesions were not detected at early stages (10). In the NELSON trial, adenocarcinomas were the most frequently detected lung cancer subtype, 123 out of 203 screened cases. Lower proportions of squamous cell or small-cell lung carcinomas were detected in the screened

Table I. Overview of the major trials on low-dose CT scans.

Trial	NLST (10)	DANTE (19)	DLCST (20)	NELSON (12)	MILD (21)	LUSI (22)
Year	2011	2015	2016	2020	2019	2020
Country	USA	Italy	Denmark	Belgium and The Netherlands	Italy	Germany
No. of subjects	53,454	2,250	4,104	15,822	4,099	4,052
Eligibility						
Age, years	55-74	60-74	50-70	50-75	49-75	50-69
Pack-years	≥30	≥20	>20	≥15	≥20	≥15
Quit years	<15	<10	<10	<10	<10	<10
Comparator	Annual chest X-ray	Annual clinical review	-	-	-	-
Mortality reduction						
Lung cancer	20%	1%	0%	26% male 61% female	39%	24%
All-cause	6.7%	5%	0%	-	20%	1%

The numbers in parentheses refer to references. DANTE, Detection and screening of early lung cancer with Novel imaging Technology; DLCST, Danish Lung Cancer Screening Trial; LUSI, German Lung cancer Screening Intervention; MILD, Multicentric Italian Lung Detection Cancer; NELSON, Nederlands-Leuvens Lungkanker screenings ONderzoek; NLST, National Lung Screening Trial.

group, compared to the non-screened group. However, the low-dose CT scan consistently detected the different cancer subtypes at lower stages of disease (12).

A very recent meta-analysis revealed that among smokers screened for lung abnormalities using a low-dose CT scan, the most frequent histologic type was adenocarcinoma, followed by squamous cell and small cell carcinomas (18).

In addition to the NLST and NELSON trials, Table I lists the main studies adopted in the majority of randomized controlled trials (RCTs) on the use of a low-dose CT scan for lung cancer screening (12,19-22). The RCTs in Table I established low-dose CT scan as the most convenient and advantageous tool in lung cancer screening. Therefore, governing bodies and societal recommendations published guidelines adopting it for lung cancer screening (Table II) (23-29).

Defining the high-risk population

The risk of lung cancer consistently increases with age and smoking. The latter remains a leading risk factor for lung cancer, contributing to >70% of worldwide lung cancer-related deaths (30), particularly with an elevated number of pack-years (31,32), although lung cancer also occurs in never-smokers (33-37). Other predisposing factors include a family history of lung cancer (38), asbestos exposure and second-hand smoking, as well as less obvious risk factors, such as exposure to cooking fumes, to hormone replacement therapies and to certain viral infections such as human papillomavirus (39).

Globally, following the NLST, several societal, governmental and regulatory bodies and later some reimbursement bodies, adopted the same criteria for the selection of the high-risk population, while others shifted the definition. The rationale behind the shift derives from studies demonstrated social, ethnic, racial, regional and factorial disparities in the rates of lung cancer incidence and mortality. Recently, the National Comprehensive Cancer Network (NCCN) included a new group in their guidelines, taking into consideration the presence of other factors related to personal and family history (23). Therefore, there is still no globally standardized definition of the high-risk population yet and variable classifications are drawn and adopted by different stakeholders (Table II).

In Lebanon, among the 1,133 cases of lung cancer diagnosed in 2016, 53% were patients in the 55-74-year age group (40). Pollution is an additional risk factor contributing to the increase in lung cancer incidence. In a country where the main governmental power grid is not reliable, highly polluting diesel generators remain an indispensable choice for all public and private sectors, including households and the health, educational, economic and touristic sectors (41). This is in addition to overloaded traffic and unregulated waste incineration (41). Moreover, apart from the widespread use of the combustible cigarettes, water-pipe (hookah or shisha) smoking is very popular in Lebanon, particularly among younger adults (42). The water-pipe has also recently gained popularity worldwide (43,44). While it is mistakenly perceived as a safer alternative to combustible cigarette smoking, scientific evidence strongly refutes this widespread belief (45). Of note, one cigarette contains ~1 g of tobacco, while one shisha session consumes between 8 and 12 g of tobacco (46). Plasma nicotine (cotinine) levels following a 1-h shisha session is equivalent to ~100 cigarettes and a single breath of shisha delivers 8-fold more smoke particles than would a breath of cigarette (47). In practice, comparing cigarette and Shisha smoking is difficult since Shisha smoking occurs over prolonged durations and with each puff, the volume inhaled is higher in addition to the presence of other forms of known carcinogens in the constituents. It has been shown that Shisha smoking increases the risk of

Table II. Recommendations for lung cancer screening using a low-dose CT scan.

Organization and year	Statements
2021	
National Comprehensive Cancer Network	Recommends yearly screening with Low-dose computed tomography to •Group 1: Adults 55 to 77 years of age who have ≥30 pack-years of smoking (current smokers or who have quit within the past 15 years) •Group 2: Adults ≥50 years of age with ≥20 pack-years of smoking, had quit at any time, with at least one additional risk factor beside second hand smoke (family history of lung cancer, diagnosis of COPD, occupational exposure to known carcinogen or personal history of tobacco-related malignancy) (23).
US Preventive Services Task Force	The USPSTF recommends annual screening for lung cancer with low-dose CT in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years (24).
American College of Chest Physicians	For asymptomatic individuals aged 50 to 80 who have smoked ≥20 pack years and either continue to smoke or have quit within the past 15 years, annual screening with low-dose CT is recommended (25).
American Society of Clinical Oncology	ASCO recommends […] yearly screening with a low-doseCT scan […] for people age 55 to 74 who have smoked for 30 pack years or more. It is also recommended for those age 55 to 74 who have quit within the past 15 years (26).
American Lung Association	Screening is recommended (for subjects who are) 50-80 years of age, have a 20 pack-year history of smoking, and are a current smoker, or have quit within the last 15 years (27).
2018	
American College of Chest Physicians	Annual screening with low-dose CT is recommended for adults 55 to 77 years of age with no symptoms of lung cancer who have smoked at least 30 pack years, and who continue to smoke or have quit within the past 15 years (28).
2016	
The Canadian Task Force on Preventive Health Care	Screening is recommended for lung cancer among adults 55 to 74 years of age with at least a 30 pack-year smoking history,who smoke or quit smoking <15 years prior, with low-dose computed tomography (CT) every year up to three consecutive years (29).

The numbers in parentheses refer to references. ASCO, American Society of Clinical Oncology; CT, computed tomography; USPSTF, US Preventive Services Task Force.

lung cancer by 6-fold in comparison to non-smokers (48). Furthermore, carboxyhemoglobin forms faster and the heart rate increases faster upon water-pipe smoking, than with the combustible cigarette further underscoring the need for physicians to advise their patients that water-pipe smoking exposes them to some of the same toxicants as cigarette smoking (49).

All these particularities were taken into consideration by the panel who proposed, as displayed in Fig. 1, defining the high-risk population eligible for screening for lung cancer using low-dose CT scan as follows: i) Male or female subjects, between 55 and 74 years of age, with a smoking history of 30 pack-years, whether current smokers or having quit tobacco within 15 years; ii) or current smokers of at least one shisha session per week for a period of >10 years or for ex-smokers of the same rate who have quit within 15 years; iii) these subjects should undergo yearly screening, along with a smoking cessation counselling program, and in the case of a diagnosis of lung cancer, they should be offered a proper medical follow-up.

Recommendations. For screening eligibility, the following factors are considered: i) An age between 55 to 74 years; ii) smoking history: 30 pack-years and/or at least one shisha session per week for a period of >10 years for current smokers or for those who have quit tobacco within 15 years.

Pillars to success

The implementation of lung screening programs worldwide has been limited due to numerous reasons and it is essential that a generalized awareness is key to optimize the benefits.

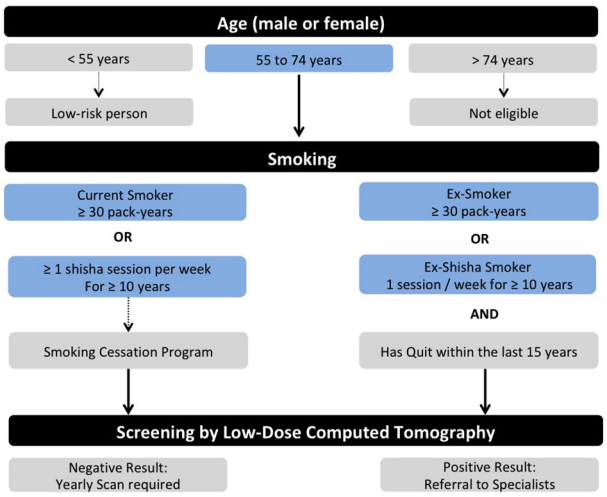

Figure 1. Pathway for the identification of the individuals eligible for lung cancer screening by low-dose computed tomography scan in the Lebanese population.

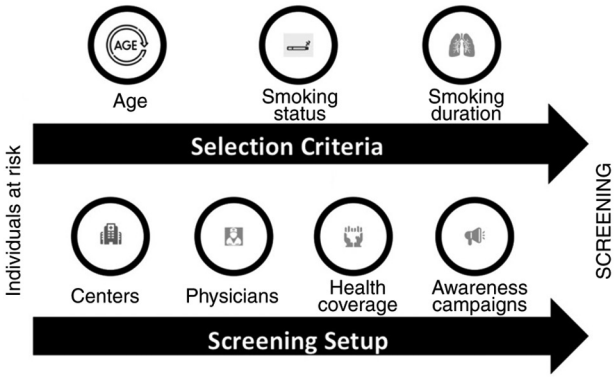

Figure 2. Defining the selection criteria and setting up the screening initiative for individuals at risk of developing lung cancer.

Practically, high-risk individuals whose low-dose CT scan results are negative still need to be screened on a yearly basis. The annual incidence of lung cancer detection by this approach revolves ~1%, further underscoring the urge to set and improve such a screening initiative (50,51). In addition, for this initiative to be sustained and successful, there should be an in-depth analysis of the unmet needs in the Lebanese society. In fact, the success of a lung screening is dependent on three main pillars: i) A nationally established standardized program with evidence-based guidelines and high-quality services and facilities. Optimal smoking cessation programs, a proper follow-up (and expert referral for positive findings), and further management potentials are of significance as well. ii) High adoption levels by individuals, physicians and concerned bodies and societies. Complete adherence to the program and sustainability are also primordial. iii) Successful continuous awareness and educational, promotional and incentive campaigns.

The overall setting of a screening campaign is summarized in the schematic diagram in Fig. 2; it displays the selection criteria for the population at risk eligible for screening and presents the pillars in the success of a screening initiative, tackling different aspects from the selection of centers to the promotional and awareness campaigns as well as the involvement of physicians and third-party payers. Each aspect will be detailed individually in the following sections of this manuscript.

Quality and logistics

For the expert panelists, the quality of screens is very important and affects outcomes as well as the cost-effectiveness of a lung screening program. In fact, realistically, there is variability between centers in Lebanon in relation to their qualification to perform lung cancer screening and the program must thus include criteria to organize the practice.

Centers. According to expert panelists, not all centers in Lebanon are well-equipped with high-resolution CT scans, while this is an essential component of a beneficial program. Furthermore, even in the centers that possess such machines, set-ups and changing the parameters might constitute a hectic task. In addition, there is a lack in trained personnel. However, with some facility-related restructuring and organization, the process can be established through specific schedules, acquiring separate machines and collaboration between centers. The panel suggests selecting no more than 25 well-equipped centers, geographically distributed across Lebanon and specialized in lung cancer screening. The centers shall host trained and dedicated nurses, radiologists and technicians, and should elaborate and implement nationwide standards.

Radiologists. It has been recognized globally that only expert radiologists, trained and qualified for interpretation of the scans must be designated. In addition, for an optimal screening process, there should be a unified and standardized classification and reporting system. For these reasons, the panel recommends the limitation of radiologists who are eligible to perform the screening through the limitation of centers as mentioned above. Each center shall include an expert radiologist according to set criteria. These criteria along with standardized radiologic criteria can be set by the Lebanese Ministry of Public Health (MoPH) in alignment with the Lebanese society of radiology and it can also be done through a consensus. Another interesting option the panel proposed is the designation of few expert radiologists by the MoPH to take care of the readings. Thus, with more and more readings, more expertise can be obtained as well as more standardization of readings. This option appears reasonable in a small country, such as Lebanon, while the practice can be made possible by sending the scans performed in different centers to a central station. This is an easy possibility nowadays with all the development that was witnessed in data transmission in the last decade.

Recommendations. For quality and logistics, the following are recommended: i) Well-equipped centers geographically distributed across Lebanon implementing nationwide standards; ii) limit recognized centers to no more than 25 in the country; iii) centers shall include high resolution machines and trained personnel; iv) centers shall have expert radiologists

with specific criteria (set on the national level), or central readings by a limited number of radiologists appointed by the ministry of public health. The possibility of expansion of the number of centers with time and according to the need and qualification is also proposed.

Awareness to all

Referring physicians. All licensed physicians registered at the Lebanese order of physicians are eligible and invited to participate in the program whether a primary care physician or a specialist. However, a recent study revealed a lack of awareness related to lung cancer screening even among pulmonary physicians (52). Thus, the panel recommends awareness campaigns for physicians to be organized by different stakeholders, the launch of accredited programs and invites physicians to self-educate on the matter, since the basics are relatively simple. The present consensus study may also be helpful in that perspective. Physicians shall include individuals in the program following a medical visit and it is recommended that a shared written informed consent should be signed after counseling by the physician on the importance of lung cancer screening. Physicians are also responsible of explaining the benefits of adherence and sustainability to the program, the importance of smoking cessation and the risks of false positives and negatives, as well as the possible complications of further procedures if needed. In parallel, a discussion with the persons on the possibility of finding other pathologies through the scans, and on the decreased risks of repeated radiation exposure with low-dose CT scans, since this may be an anxious point they may be fearful of. Individuals may also share their fear of diagnoses and thus physicians need to discuss and alleviate this concern. Referrals to smoking cessation programs shall also be proposed during this visit. Of note: i) Every interested and prepared licensed referring physician can participate; and ii) referrals are recommended to occur following medical visits and after a signed informed consent.

Awareness in the population. The importance of early diagnosis is still under-recognized in the Lebanese population, with an ambivalence faced regarding the effectiveness of adopting health-related behavioral changes, in addition to the fear felt by the general population towards radiation exposure. The panel recommends large-scale awareness campaigns targeting the general population on the importance of lung screening and timely detection of any lesions and on the essential role of low-dose CT scan in such screening, and its safety profile given its very low radiation exposure. Awareness campaigns should also promote health beliefs and perceived benefits of risk factor mitigation, mostly smoking cessation. Learning from previous successful campaigns can help draw a successful strategy targeting a beneficial and successful implementation and funding for such campaigns can be mirrored to previous experiences. Campaigns shall focus on the importance of early diagnosis, the decrease in burden and optimal outcomes of treating the disease at early stages in addition to a benefit in the reduction of mortality. Moreover, sustainability is key for the person to completely adhere to the program and this message is to be transmitted. In addition, smoking cessation campaigns are to be associated to motivate cessation, to increase referrals to smoking cessation programs and institutions, as well as to try to hinder smoking initiation especially by the youth. Of note: i) Awareness campaigns to the people are key; ii) focus should be placed on the benefits of screening and of complete adherence, as well as the harms of smoking.

Awareness to regulatory and reimbursement bodies. The benefits of lung cancer screening are important on all levels whether medical, social, cost-related and on the management level. In particular, oncologists, pulmonary physicians and radiologists in addition to expert physicians should raise to the MoPH the issue of late-stage diagnosis of lung cancer and the tremendous cost of treating advanced stage diseases; in an attempt to promote lung cancer screening by low-dose CT scan as a cost-effective measure. Awareness campaigns and workshops should target and educate concerned parties. In fact, due to the misconception that lung cancer is exclusively a self-inflicted disease, great resistance has been observed from third-party payers to cover lung cancer screening tests. Additionally, the MoPH has been reluctant to ratify the establishment of a lung cancer committee to implement screening recommendations. The panel suggests developing a policy in light of the clinical trial evidence and highlighting the cost-effectiveness of lung cancer screening for early detection to both third-party payers and the MoPH. It may be difficult to implement with the current situation of the paying parties; however, the panel encourages at least a cost-effectiveness analysis that will show the benefits of screening on the health system and in lowering the burden. Short and long-term strategies can be established on that basis. Awareness campaigns and workshops are to be organized and proposed to these bodies. Of note: i) Awareness may be made through campaigns and workshops to third-party payers; ii) delineate the moderate-term and long-term cost benefits; iii) invitation for cost-effective analysis and the establishment of strategies.

Coverage of lung cancer screening

Panel physicians expressed their dismay at the difficulty of ensuring financial coverage for screening purposes. Medical coverage schemes, whether private insurance companies, mutuality funds or the National Social Security Fund (NSSF) tend to block the coverage of screening tests. This is in discordance with global practice. In the UK, CT screening is a recommended clinical practice, subject to guidelines and reimbursement (9). This indicates the urgent need for a nationwide supported initiative to implement lung cancer screening among the population at high risk for lung cancer.

The success of such an initiative will translate into the prevention of mortality and morbidity from lung cancer, the alleviation of the healthcare burden of lung cancer, and a reduction in economic losses due to sickness and absenteeism. From a health economics standpoint, launching a lung cancer screening program in Lebanon, using low-dose CT scan could, at the long run, prove beneficial and save third-party payers substantial funds. Between 2008 and 2013, the total average annual cost of drugs for lung cancer was estimated at 11,397,019 USD; constituting 6.5% of the total healthcare expenditure on major cancers (53).

Third-party payers (pharmaceutical companies, non-governmental organizations and medical societies) could

be approached for financial support in covering, at least partially, screening costs by low-dose CT scans in established, specialized and properly maintained centers.

A lung cancer screening task force could be established, including members from the LPS and LSMO. This task force, under the patronage of the MoPH, could oversee the nation-wide implementation of the local guidelines for lung cancer screening, in terms of health facility mapping and equipment, training of dedicated personnel and access of the high-risk population. Moreover, the Ministry of Economy and Trade could impose additional taxation on tobacco products to raise their retail price in an attempt to limit smoking (54). Of note, it may be beneficial to develop a policy to unify the screening procedure and the financial coverage of yearly screening in persons-at-risk by third party payers.

Smoking cessation

According to a 2022 study, smoking prevalence in Lebanon stands at 27%, the highest between several other countries in the Middle East, heavily contributing to the occurrence of lung cancer (6). An earlier study reported a prevalence of close to 35%, with twice as many male as female smokers, and a three-fold likelihood of hospitalization among smokers than among non-smokers (55). While taking up smoking is a personal decision, smokers find it difficult to quit smoking and long-term tobacco use engenders the risk of lung cancer. Smoking cessation initiatives, whether personal or with the aid of a counselor, often do not yield the desired outcomes (56,57). However, the usefulness of smoking cessation counseling depends deeply on the counselors' knowledge of clinical practice guidelines, on perceived support, the belief that smoking cessation will positively impact health, and the presence of formal smoking cessation programs (58). The Lebanese Ministry of Public Health tobacco control program (https://www.moph.gov.lb/en/Pages/2/3173/tobacco-program) could serve as a platform for smoking cessation interventions and guidance. Globally, active tobacco control programs have resulted in decreased rates of lung cancer, attesting to their usefulness (59-62). In addition to public health-oriented behavioral interventions, a pharmacological approach to smoking cessation might yield long-term abstinence from smoking (63-65). Nicotine-replacement preparations are efficient first-line agents (65). Veranicline is an FDA-approved medication for smoking cessation, with proven benefits (63,64). Sustained-release bupropion or clonidine can also be offered to help with smoking cessation (65). Smoking control interventions and disease surveillance frameworks are required to alleviate healthcare burden and to establish health-related policies (55). On the whole, the following may be beneficial: i) Smoking cessation guidelines, clinics and campaigns are essential for successful lung cancer screening programs; ii) reliance on programs already set by the MoPH in Lebanon.

Panel recommendations

The following recommendations are proposed: i) The panel recommends a yearly low-dose CT scan for all subjects at high risk of lung cancer, who are aged 55 to 74 years, and have a smoking history of cigarettes and/or shisha; ii) well-equipped centers geographically distributed across Lebanon with trained and dedicated personnel, and implementing nation-wide standards; iii) developing a policy to unify the screening procedure and the financial coverage of yearly screening in persons-at-risk by third party payers; iv) awareness campaigns for the general population on the importance of screening, the safety and efficacy of low-dose CT scan, and the promotion of health-related behavioral changes mostly smoking cessation; v) awareness campaigns for the physicians involved in the screening initiative on the selection of specific profiles for the screening.

Conclusion

The present joint statement highlights the importance of a large-scale screening campaign for lung cancer using low-dose CT scan. Despite the limited implementation of low-dose CT scan for the screening of lung cancer in Lebanon, a recent study demonstrated that a significant proportion of primary care physicians and pulmonary specialists are still using suboptimal screening modalities, such as chest radiography (despite the availability and accessibility of more advanced technology), with an inaccurate selection of the population at risk (52). This highlights the need for new guidelines that are set by this consensus, recommending the targeting of the general population, the physicians involved in all phases of lung cancer care, and dedicated personnel in specialized centers, for a successful screening campaign. In addition, the panel seeks the support of third-party payers to make this program marketable; including consultation, CT screening, smoking cessation counseling and psychological/clinical follow-ups, as needed. With a clear definition of the high-risk patient population for lung cancer now established in Lebanon, along with recommendations on setting up a nation-wide lung screening initiative, the present report encourages a collective effort from medical and public health societies with the support of third-party payers to implement such an initiative.

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Authors' contributions

All authors (ZAB, NB, FEK, GJ, FN, RN, AT and SZ) contributed to the collection of international guidelines, setting the local guidelines, writing and reviewing of the manuscript. All authors have read and approved the final manuscript. Data authentication is not applicable.

Ethics approval and consent to participate

Not applicable.

Patient consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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