The American Association for Thoracic Surgery guidelines for lung cancer screening using low-dose computed tomography scans for lung cancer survivors and other high-risk groups

Michael T. Jaklitsch, MD,[a] Francine L. Jacobson, MD, MPH,[a] John H. M. Austin, MD,[b] John K. Field, MA, PhD BDS, FRCPath,[c] James R. Jett , MD,[d] Shaf Keshavjee, MSc, FRCSC, MD,[e] Heber MacMahon, MB, BCh,[f] James L. Mulshine, MD,[g] Reginald F. Munden, MD, DMD, MBA,[h] Ravi Salgia, MD, PhD,[f] Gary M. Strauss, MD,[i] Scott J. Swanson, MD,[j] William D. Travis, MD,[k] and David J. Sugarbaker, MD[a]

Objective: Lung cancer is the leading cause of cancer death in North America. Low-dose computed tomography screening can reduce lung cancer–specific mortality by 20%.

Method: The American Association for Thoracic Surgery created a multispecialty task force to create screening guidelines for groups at high risk of developing lung cancer and survivors of previous lung cancer.

Results: The American Association for Thoracic Surgery guidelines call for annual lung cancer screening with low-dose computed tomography screening for North Americans from age 55 to 79 years with a 30 pack-year history of smoking. Long-term lung cancer survivors should have annual low-dose computed tomography to detect second primary lung cancer until the age of 79 years. Annual low-dose computed tomography lung cancer screening should be offered starting at age 50 years with a 20 pack-year history if there is an additional cumulative risk of developing lung cancer of 5% or greater over the following 5 years. Lung cancer screening requires participation by a subspecialty-qualified team. The American Association for Thoracic Surgery will continue engagement with other specialty societies to refine future screening guidelines.

Conclusions: The American Association for Thoracic Surgery provides specific guidelines for lung cancer screening in North America. (J Thorac Cardiovasc Surg 2012;144:33-8)

Lung cancer remains the most common cause of cancer death in the United States and Canada. This year there will be more lung cancer deaths alone than the combined deaths from breast, prostate, and colon cancer. Effective screening programs have identified early cases of the other 3 cancers, but until recently lung cancer has lacked an effective screening tool.

Changes in disease demographics have witnessed a doubling of lung cancer incidence and a decline in tuberculosis over the past 30 years. Minimally invasive techniques have dramatically improved the safety and expected recovery of surgical resections. Most important, the publication of the National Lung Screening Trial (NLST) has established the ability of low-dose computed tomography (LDCT) scans to decrease lung cancer–specific mortality by 20% in a screened high-risk population.[1]

As a result of the International Association for the Study of Lung Cancer (IASLC) Screening Workshop 2011, the IASLC created a Strategic Screening Advisory Committee to engage stakeholder professional societies in lung cancer computed tomography (CT) screening implementation across the globe. The charge was to deliver guidelines for radiologic screening, clinical workup for indeterminate nodules, pathology reporting of nodules, and recommendations for surgical and therapeutic interventions for suspicious nodules. In addition, societies were charged to create guidelines and recommendations for identification of high-risk individuals for lung cancer CT screening and integration of smoking cessation. The IASLC framed these goals for the integration of lung cancer screening guidelines into the existing healthcare structure of each nation. The

From the Brigham and Women's Hospital,[a] Harvard Medical School, Boston, Mass; Columbia Presbyterian Hospital,[b] New York, NY; University of Liverpool,[c] Liverpool, England; National Jewish Hospital,[d] Denver, Colo; Toronto General Hospital,[e] Toronto, Ontario, Canada; University of Chicago,[f] Chicago, Ill; Rush Medical College,[g] Rush University, Chicago, Ill; The University of Texas MD Anderson Cancer Center,[h] Houston, Tex; Tufts Medical Center,[i] Boston, Mass; Dana-Farber Cancer Institute,[j] Boston, Mass; and Memorial Sloan-Kettering Cancer Center,[k] New York, NY.

Disclosures: Michael T. Jaklitsch, John H. M. Austin, Reginald F. Munden, Gary M. Strauss, William D. Travis, and David J. Sugarbaker have no commercial interests to disclose. Francine L. Jacobson reports grant funding from Toshiba. John K. Field reports advisory board member work for Epigenomics and Roche Diagnostics. James R. Jett reports grant research support from Oncimmune and Metabolomx. Shaf Keshavjee reports grant research support from Astellas Canada and Axela/Exceed, clinical trial support from Vitrolife, and being awarded a Wyeth Pharmaceuticals/CIHR Rx&D Clinical Research Chair in Transplantation. Heber MacMahon reports advisory board member and consultant work for Riverain Medical, consultant work for Biomet, and royalties from UC Tech (University of Chicago). James L. Mulshine reports a family member who is an employee of Accretive Health. Ravi Salgia reports advisory board member work for Cephalon and Methylgene, and research funding from Eli Lilly. Scott J. Swanson reports consulting fees for Ethicon and Covidien.

Address for reprints: Michael T. Jaklitsch, MD, Brigham and Women's Hospital, Department of Thoracic Surgery, 75 Francis St, CA-257, Boston, MA 02115 (E-mail: mjaklitsch@partners.org).

0022-5223/$36.00

doi:10.1016/j.jtcvs.2012.05.060

Abbreviations and Acronyms

AATS = American Association for Thoracic Surgery
CT = computed tomography
CXR = chest x-ray
FEV_1 = forced expiratory volume in 1 second
IASLC = International Association for the Study of Lung Cancer
LDCT = low-dose computed tomography
NLST = National Lung Screening Trial

American Association for Thoracic Surgery (AATS) has begun this process for the United States and Canada.[2]

MATERIALS AND METHODS

The AATS convened a lung cancer screening and surveillance task force to examine the evidence in favor of lung cancer screening. The specific goal of this panel was to provide guidelines to health care practitioners who care for high-risk populations, including smokers and nonsmokers, with additional risk factors. An additional specific mandate was to develop guidelines for screening lung cancer survivors. This multidisciplinary panel included representatives from thoracic surgery, medical oncology, pulmonology, pathology, and radiology, with members selected on the basis of demonstrated expertise in identifying risks and benefits of screening lung cancer using LDCT. Although the following recommendations of this task force may be applicable to many parts of the world, they are specifically intended to guide screening within the United States and Canada. This recommendation is based on the high incidence of lung cancer within these 2 highly developed nations, a rate that exceeds other regions of North America. Specifically, the age-standardized incidence rate is 42.13 per 100,000 people of all ages and both sexes in the United States (third largest in the world) and 35.88 per 100,000 in Canada (ninth largest in the world).[3] Other areas of Latin America and the Caribbean have age-standardized incidence rates less than 10 per 100,000 people.

In broad overview, our task force guidelines build on the work of the NLST,[1] as recommended by the IASLC Computed Tomography Screening Workshop of 2011 report.[2] Our recommendations further expand the recently published National Comprehensive Cancer Network Guidelines Version 1.2012 for Lung Cancer Screening.[4] We do not limit screening to the highest risk group of smokers recruited to the NLST trial, but recommend screening for a larger population by both age and by broadening the risk categories. We support the development of databases for refinement of evidence-based guidelines. We believe LDCT provides an opportunity for a "teachable moment" for tobacco cessation. Furthermore, we identify future areas of research that are likely to influence the screening of lung cancer in the near future, such as the incorporation of biomarker data into screening decisions.

RESULTS

The American Association for Thoracic Surgery Guidelines for Lung Cancer Screening in North America

Our present culmination of knowledge leads this panel to offer tiered recommendations in regard to 3 screening populations (Figures 1-5). Tier 1 includes those subjects at highest risk for whom there is level 1 evidence[5] to recommend screening (ie, randomized prospective clinical trial data). Tier 2 includes those subjects with level 2 evidence (ie, data from case-control or nonrandomized trials) or level 3 evidence (ie, our consensus opinion) and sufficient evidence to recommend screening for individuals within this group.

Tier 1 Guideline for Highest Risk Population

Annual lung cancer screening should begin at age 55 years for smokers and former smokers with a 30 pack-year history of smoking. Annual screening may continue to age 79 years (Figure 1). LDCT is the screening technology to be used. CXR alone should not be used as a screening tool. Individuals for whom adequate treatment cannot be offered because of comorbidity or functional status, regardless of age, should not undergo screening.

This recommendation is based on the prospective randomized NLST.[1] According to the US Preventive Services Task Force, this achieves level 1 evidence (ie, data from a well-designed randomized control trial).[5] The entry criteria for the NLST trial included ages 55 to 74 years, 30 pack-years of tobacco exposure, and, if the subject had quit smoking, smoking within the previous 15 years. We have dropped the third entry criteria, believing the primary risk generators are age and tobacco exposure, thus simplifying the recommendation.

The NLST included 3 annual screens and identified a 20% reduction in lung cancer–specific mortality within the first 3 years of screening. The cancer risk does not end after 3 years, however, and there is no scientific evidence to suggest that screening should be stopped after the initial 3 annual low-dose scans.

We recognize the constraint of the trial design of the NLST protocol whereby asymptomatic individuals without a previous cancer diagnosis (excluding skin cancer) at high risk because of smoking exposure (at least 30 pack-years) and age were selected for screening over 3 years. These constraints in the study population that were necessary to complete the trial that established the efficacy of LDCT to reduce lung cancer mortality would exclude many Americans who would benefit from a lung cancer screening program. These constraints need to be examined as we move from a successful clinical trial to screening guidelines.

We recommend that annual LDCT screening be performed each year from age 55 to 79 years, and not just 3 screening scans in the lifetime of the patient. The risk of lung cancer does not decrease in subsequent years according to the NLST data. In the NLST, participants were screened yearly with LDCT or chest x-ray (CXR) for 3 years. After the period of active screening, they were followed but not screened for another 4 years. At the end of 3 years, there were 649 cancers detected in the LDCT arm compared with 279 cancers in the CXR arm. The number of lung cancers increased each year to a total of 1060 in the LDCT arm and 941 in the CXR arm at the end of the study. The original NLST report (Figure 6) shows an