Surgeons and Lung Cancer Screening
Rules of Engagement

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KEYWORDS

• Lung • Cancer • Low-dose • CT • Screening • Surgeon • Program • Thoracic

KEY POINTS

- To understand the challenges of screening for lung cancer, surgeons should be familiar with the fundamental epidemiologic concepts pertaining to screening and have an understanding of the evidence regarding the various modalities used in screening for lung cancer.
- A recent study has confirmed that screening for lung cancer with low-dose computed tomography (CT) decreases mortality in high-risk individuals.
- High-quality programs should be safe and cost-effective as well as accessible to all high-risk patients and involve the participation of a multidisciplinary team.
- Surgeons need to be actively engaged in the implementation of CT screening programs as well as have input on the design of diagnostic and therapeutic decision-making algorithms.
- Thoracic surgeons should actively participate in the CT screening program in order to optimize the management of screen-detected lung nodules.

INTRODUCTION

Lung cancer is the most common cancer and the largest contributor to cancer mortality worldwide, with more than 1.8 million incident cases and 1.6 million attributable deaths in 2012.[1] In the United States alone, there will be a projected 224,210 new cases and 159,260 lung cancer deaths in 2014 representing 27% of all cancer deaths in the United States.[2] The mortality rate of lung cancer is extremely high, with a case fatality rate of 87%.[1] In patients diagnosed with lung cancer, the overall 5-year survival is reported in the realm of 15%.[3]

The dismal survival seen with lung cancer is in part caused by the large proportion of patients who present with locally advanced or metastatic disease. The 15% of patients with lung cancer who present with disease localized to the primary site experience 54% survival at 5 years. Unfortunately, advanced disease at the time of diagnosis is much more common, with 22% of patients presenting with regional lymph node involvement and 57% presenting with distant metastases. The 5-year survival in these groups is substantially worse at 26% and 4%, respectively.[4] Given this, the potential for screening to improve early

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detection and reduce mortality has been the subject of much investigation.

EPIDEMIOLOGY OF SCREENING

Screening has been defined as

> *The presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly to sort out apparently well persons who probably have a disease from those who probably do not. A screening test is not intended to be diagnostic. Persons with positive or suspicious findings must be referred to their physicians for diagnosis and necessary treatment.*[5]

The central assumption underlying the presumed utility of any screening program is that prognosis is improved by early detection and treatment of a given disease at an asymptomatic stage.[6]

The development and implementation of screening programs is a complex endeavor. Although the aim is to improve health, such interventions may also have the potential to harm the health of individuals or negatively impact the economic health of a nation. Therefore, it is important to take a principled approach to the implementation and evaluation of screening programs. The seminal publication by Wilson and Jungner[7] enumerated the principles of early disease detection or screening (**Box 1**). These principles provide a structured approach to follow when designing a screening program. If these conditions are not met, the benefits of implementing a proposed screening program should be questioned.

It is essential that screening programs be evaluated in a similarly principled manner. Factors contributing to the overall evaluation of screening programs include validity, reliability, feasibility, and effectiveness.[6] Each of these criteria is summarized briefly next.

1. *Validity*: The better the test, the higher its ability to accurately classify as positive those with a disease (sensitivity) and to classify as negative those without a disease (specificity). There is often a trade-off between these two measures of validity, erring toward increased sensitivity when the repercussions of missing a case of disease are high (as with a highly fatal disease) and increased specificity if the further steps required to establish a diagnosis are invasive or potentially harmful.
2. *Reliability*: Reliable tests provide consistent, repeatable results when performed in similar patients under comparable conditions. Reliability is influenced by the dependence of the test result on interpretation by the operator, the variability of the feature being measured in a given patient, as well as the consistency of the tool being used for measurement.
3. *Feasibility*: This feature is complex and is often difficult to quantify with one or a small number of measures. It involves acceptability of the testing program to the public, the cost

Box 1
The principles of early disease detection or screening

1. The condition sought should be an important health problem.
2. There should be an accepted treatment of patients with recognized disease.
3. Facilities for diagnosis and treatment should be available.
4. There should be a recognizable latent stage, referred to elsewhere as a detectable preclinical stage of disease.
5. There should be a suitable test or examination.
6. The test should be acceptable to the population.
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood.
8. There should be an agreed policy on whom to treat as patients.
9. The cost of case finding (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
10. Case finding should be a continuing process and not a once-and-for-all project.

From Wilson JM, Jungner F. Principles and practice of screening for disease (Public Health Papers No. 34). Geneva (Switzerland): WHO; 1968. Available at: http://whqlibdoc.who.int/php/WHO_PHP_34.pdf. Accessed July 17, 2014.