Lung Cancer Screening

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Cancer is second only to heart disease as the leading cause of death in the United States, and lung cancer is the most common cause of cancer-related deaths in both men and women. Risk factors for lung cancer include smoking, environmental exposures (second-hand smoke, asbestos, radiation), pulmonary fibrosis, and HIV infection. Overall, the five-year survival rate for lung cancer is poor; currently estimated at about 16%. Prognosis of non-small-cell lung cancer is related to stage, with medial survivals of about four to five years for Stage I disease, two to two-and-a-half years for Stage II disease, and about one year for Stage III disease. Prognosis of non-small-cell lung cancer is also related to histologic cell type. Bronchoalveolar cell carcinoma, now termed adenocarcinoma in situ or minimally invasive adenocarcinoma, has the best survival rate; large-cell and invasive adenocarcinomas carry the worst prognosis.

Given the dismal survival for advanced stage disease, one would assume that early detection of lung cancer would lead to improved outcomes. Prior to 2010, this had not been proven. An early attempt at screening, the Mayo Lung Project, showed that screening with chest films and sputum cytology could detect many resectable lung cancers, but resulted in no difference in lung cancer mortality between those subjects who were aggressively monitored with radiographs and cytology and those who were not. The Pittsburgh Lung Screening Study (PLuSS) evaluated the use of low-dose CT as a means for screening from 2002 to 2005. In more than 3,400 smokers or ex-smokers, age 50 to 79, 40.6% had lung nodules detected by low-dose CT. There were 80 lung cancers detected in this population; 53 noted at the first screen and the remainder at follow-up. Of the 80 cancers found in the PLuSS study, half were early stage. About one-third (27/80) of the cancers were not present on the original CT. Of these subsequent cancers, 37% (10/27) were small-cell carcinomas. 82 patients underwent thoracotomy or video-assisted thoracic surgery (VATS) for lung nodules. Of these patients, 54 had lung cancer and 28 had a non-cancer diagnosis. The PLuSS study concluded that CT detects many indeterminate nodules, as well as early lung cancer and that there was a tendency toward “overly aggressive” diagnostic evaluation.

Between 2002 and 2004, the National Lung Screening Trial (NLST) screened nearly 50,000 patients between the ages of 55 and 74 who were current or ex-smokers and who had at least a 30 pack-year history of smoking. Half of the study population received yearly CT scans and half received yearly chest films for a total of three imaging studies in two years. At the time of publication, there was a six-year follow-up. The overwhelming majority of positive screens (96.4% of CT scans and 94.5% of chest x-rays) were false positive studies. Lung cancer caused 25% of the deaths during this period.

Lung cancer mortality was reduced by 20% in the CT-screened group, and overall mortality was reduced by 6.7% So, 320 patients would need to be screened in order to prevent one cancer-related mortality. The NLST was the first trial to demonstrate improved mortality with lung cancer screening. There are several real and potential disadvantages to screening CT. First, CT scans expose patients to radiation. A low-dose CT is about the equivalent to 15 chest x-rays. A standard CT is equivalent to 80 chest x-rays (as a means of comparison, mammography is equivalent of four chest x-rays). Secondly, the many false positive studies can potentially lead to additional tests and procedures that add cost and risk to the patient with no tangible benefit, while causing undue worry and stress. Finally, many of the abnormalities detected by screening CT were ground glass opacities, which often represent adenocarcinoma in situ or minimally invasive adenocarcinomas (formerly bronchoalveolar carcinomas). These cancers tend to have a longer doubling time and have less impact on overall lung cancer mortality. Detection of these cancers by screening CT may result in interventions that are not ultimately beneficial to the patient. Therefore, it is essential that the patient follow up with specialists knowledgeable in screening CT and in lung cancer management.

The true cost benefit of lung cancer screening with low-dose CT has yet to be accurately calculated. Therefore, neither the Center for Medicine Services (CMS) nor private insurance carriers cover screening CT. Furthermore, there is no CPT code that allows physicians to order the low-dose CT screening study. In response to the anticipated demand for this service before the publication of the NLST results in June 2011, the UPMC Comprehensive Lung Center, in collaboration with the Department of Imaging Services at UPMC Presbyterian, established a Lung Cancer Screening Clinic at the Oakland campus. This clinic is run as a group visit model and is directed by a nurse. Patients are charged a flat fee and receive a 20-minute presentation on the program, including the benefits and limitations of screening CT. They then receive a low-dose CT, after which both the patient and their primary care physician (PCP) receive a letter with follow-up recommendations. If there are no abnormalities, they are instructed to follow up in one year, according the NLST protocol. To date, 36 patients have been screened. 39% had lung nodules, none of them suspicious for lung cancer, and 47% had coronary calcifications indicative of coronary atherosclerosis.

Suggested reading: