ORIGINAL ARTICLE LEADERSHIP

Initial Outcomes of a Lung Cancer Screening Program in an Integrated Community Health System

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Abstract

Purpose: Lung cancer screening with low-dose CT (LDCT) demonstrated reduced mortality in the National Lung Screening Trial, yet there is debate as to whether the reported efficacy can translate into comparable effectiveness with community-based screening. The authors' purpose is to report the baseline patient characteristics and malignancy rate in the first 18 months after implementing a lung cancer screening program in an integrated community health system.

Methods: Patients were screened at 1 of 10 participating community-based centers within a 22-hospital system from 2013 to 2015. LDCT examinations were interpreted by 1 of 20 radiologists using structured reporting and an internally developed tracking system. Manual chart review was performed to ascertain the malignancy detection rate.

Results: A total of 357 patients were screened with LDCT. Of these, 80 patients were ineligible and 3 declined enrollment. The remaining 274 patients satisfied accepted screening criteria and were enrolled in the program. Malignancy was detected in a total of 11 enrollees (4.0%), 8 with lung cancer and 3 with extrapulmonary primary malignancies. Three patients (1.1%) were diagnosed with early-stage lung cancer and received definitive therapy.

Conclusions: Early-stage lung cancer was detected with LDCT screening in an integrated community health system at a rate similar to other trials.

Key Words: Lung cancer screening, low-dose CT, LDCT, lung nodules, pulmonary nodules, lung cancer

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PURPOSE

Lung cancer is the leading cause of cancer-related death among men and women in the United States [1]. In 2011, the National Lung Screening Trial (NLST) reported a 20% relative reduction in lung cancer mortality and a 6.7% reduction in all-cause mortality with annual low-dose CT (LDCT) compared with chest radiography. On the basis of these results, it was estimated that 320 patients would need to undergo screening to prevent 1 lung cancer death [2].

Lung cancer screening with LDCT has gained clinical and political momentum following a series of landmark events. In December 2013, the US Preventive Services Task Force (USPSTF) issued a grade B recommendation for screening individuals at high risk for lung cancer (those 55-80 years of age with a ≥30-pack-year smoking

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history and currently smoking or having quit within the past 15 years) [3]. The USPSTF recommendation has resulted in private payer coverage under the Patient Protection and Affordable Care Act [4]. In February 2015, CMS approved reimbursement for LDCT screening of high-risk individuals (those 55-77 years of age with a ≥30-pack-year smoking history and currently smoking or having quit within the past 15 years) [5].

Expanded LDCT screening is anticipated nationwide following these decisions. It is uncertain, however, whether the screening efficacy derived from the 33 NLST participating centers will translate into comparable effectiveness in the community setting. Our purpose is to report the outcomes of a comprehensive lung cancer screening program in an integrated community health system after one round of screening.

METHODS

Our institutional review board waived the requirement to obtain informed consent for this retrospective study because data collection and analysis were performed as part of routine clinical care and health care quality improvement purposes. Institutional review board approval was obtained for publication of these clinical operations.

We implemented a lung cancer screening program serving an integrated health system composed of 22 hospitals, ranging in size from 14 to 454 licensed beds, and 185 clinics. A variable number of LDCT scans (range, 1-133; mean, 77.8 ± 42.6) were performed at 9 hospitals and 1 clinic during the 18-month study period (Table 1). For comparison, the volume of non-LDCT diagnostic chest CT examinations performed at these centers during the same time interval is summarized in Table 2.

Focused screening centers were established for each geographic region to provide access for patients living in rural areas. Personnel for each center included a nurse coordinator, designated LDCT-interpreting radiologists, pulmonologists, and thoracic surgeons committed to managing pulmonary nodules in accordance with contemporary guidelines.

Table 1. Number of LDCT examinations per imaging center and interpreting radiologist during 18-month study interval

	Number of LDCT Examinations				
	1-5	6-25	26-100	>100	Total
Per imaging center	1	4	3	2	10
Per interpreting radiologist	12	5	1	2	20

Note: LDCT = low-dose CT.

Table 2. Diagnostic chest CT examinations per imaging center during 18-month study interval

Number of Diagnostic Chest CT Examinations* Performed	Number of Imaging Centers
<1,000	3
1,000-5,000	4
>5,000	3

*All nonscreening chest CT protocols with or without contrast enhancement. Includes chest CT scans bundled with other examinations (e.g., CT chest, abdomen, and pelvis).

Patients presented to our program through one of two main pathways. Self- or physician-referred patients were prospectively assessed for screening eligibility by telephone interview with a nurse coordinator. The interviewer assessed patient demographics, smoking history, active symptoms, and lung cancer risk factors. Patients satisfying either USPSTF [3] or National Comprehensive Cancer Network (NCCN) [6] eligibility criteria were enrolled in our program and screened with LDCT. The other pathway retrospectively identified patients already screened at the discretion of their ordering providers without preenrollment in the program. An automated tracking application was used to alert the nurse coordinator of new LDCT scans performed on nonenrolled patients within the health system. The coordinator contacted these patients by telephone to retrospectively determine eligibility by the same aforementioned criteria. All current smokers were referred for a tobacco cessation intervention at the time of their telephone interviews.

All LDCT screening examinations were performed on ≥64-row multidetector CT scanners (GE Healthcare, Waukesha, Wisconsin; Siemens Healthcare, Erlangen, Germany; Toshiba Medical Systems, Tokyo, Japan). Images were acquired at tube voltage and current of 120 kVp and 40 mA (60 mA for body mass index > 35 kg/m^2), respectively. Axial images were obtained at 1- to 2-cm slice thickness, reconstructed with soft tissue and lung algorithms, and reformatted in coronal and sagittal planes. Axial and coronal maximum-intensity projections (10 × 2 mm) were generated to assist in nodule detection. The mean radiation dose for the study period was approximately 1.3 mSv. Imaging protocols were consistent with those used in the NLST, which reported multidetector scanners with ≥4 detector rows and a radiation dose ≤ 1.5 mSv [2].