CANCER SCREENING INITIATIVES

A blueprint for high-volume, high-quality lung cancer screening that is detecting cancer earlier—and helping to save lives

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A blueprint for high-volume, high-quality lung cancer screening that is detecting cancer earlier—and helping to save lives

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ABSTRACT

Introduction: CT lung screening (CTLS) is a powerful way to find lung cancer at the earliest stage but remains underutilized, despite the United States Preventive Services Task Force (USPSTF) guidelines issued in 2013, and the American Cancer Society (ACS) recommendation that CTLS be provided to high-risk patients with access to a high-volume, high-quality lung cancer screening center.

Purpose: This paper examines the lung cancer screening (LCS) landscape, the need for earlier lung cancer detection, and the opportunity to build screening programs that are changing the way lung cancer is treated.

Design: Using Lahey Hospital & Medical Center as an example, the following case study discusses how Lahey built a high-volume CTLS program with limited resources, and highlights its collaboration with Genentech to share a blueprint to help other health systems create their own CTLS programs.

Conclusion: Successful implementation of high-volume, high-quality CTLS programs has the potential to shift the LCS paradigm, with more cancers being detected at earlier stages compared with the national average. The difference can be lifesaving.

Lung cancer is the most lethal cancer in the United States

As the leading cause of cancer deaths in the United States, lung cancer is an extensive public health issue (McKee 2015a). Most cases are detected at an advanced stage and long-term survival remains poor (McKee 2015a, Esposito 2010).

Approximately 420 people die from lung cancer every day (NCI 2018).

Early detection can improve survival

Lung cancer is often insidious and can be asymptomatic at earlier stages. Survival advances realized in other common malignancies have yet to be achieved in lung cancer.

If lung cancer is detected early, there is an opportunity for surgical treatment or stereotactic body radiation therapy (SBRT) with curative intent. Early detection is, therefore, critical to patient survival (Henschke 2006, NCCN 2019). Previously, the absence of an effective method to screen for early-stage disease among high-risk patients was a significant challenge with lung cancer management (Esposito 2010). However, this all changed in 2011 when the National Lung Screening Trial (NLST) demonstrated a 20% reduction in lung cancer mortality with 3 rounds of annual CT lung screening (CTLS)—compared with annual chest radiographs in asymptomatic current and former heavy smokers between the ages of 55 and 74 years (McKee 2015a, NLST 2011). The NLST dramatically changed perceptions of lung cancer screening (LCS), and prompted the subsequent 2011 National Comprehensive Cancer Network® (NCCN®) recommendation for screening in patients who meet the screening criteria of the NLST. NLST screening criteria became and continue to be an NCCN category 1 recommendation, or consensus, that the intervention is appropriate (NCCN 2019).*

More recent studies have reported a larger mortality benefit than what was demonstrated by the NLST. Results from NELSON, the largest European LCS trial, showed a reduction in lung cancer mortality of 26% when 4 rounds of CTLS were used over 5.5 years in current and former heavy smoking men at high risk between the ages of 50 and 74 years (Worcester 2018).

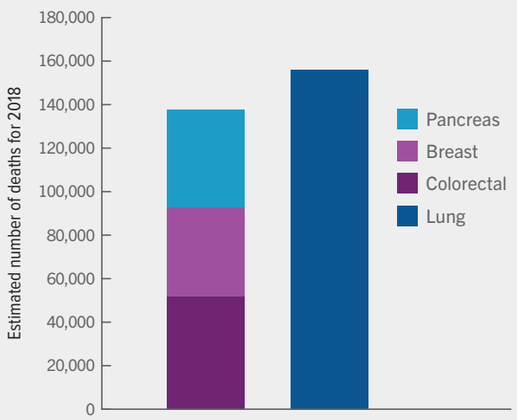
In addition, results from the Multicentric Italian Lung Detection (MILD) trial, the only randomized trial that assessed LCS beyond 5 years, showed a 39% reduction of mortality at 10 years in current and former smokers between the ages of 49 and 75 years (Pastorino 2019).

A collaborative mission to improve outcomes

Government, industry thought leaders, healthcare providers, and manufacturers share in the common mission of improving outcomes through earlier detection. Genentech and Lahey Hospital & Medical Center (Lahey) are part of this collective movement, and have collaborated on the development of educational LCS materials used by patients and healthcare providers.

This paper shares insight into Genentech's and Lahey's efforts, and how Lahey built a CTLS program with limited resources. It provides insights and experiences that other health systems can learn from when implementing their own CTLS programs.

Lung cancer causes significantly more deaths in the United States than the next 3 deadliest cancers combined



Source: NCI 2018.

*Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Lung Cancer Screening. V1.2020. © National Comprehensive Cancer Network, Inc. 2019. All rights reserved. Accessed May 14, 2019. To view the most recent and complete version of the guideline, go online to NCCN.org.

What is CTLS?

CTLS is a noninvasive, low-dose CT scan that takes several detailed 3-dimensional X-rays while using up to 90% less ionizing radiation than a traditional chest CT scan (RadiologyInfo.org 2019). The 3-D images from a CTLS help detect early-stage lung cancers that may be too small to detect by chest X-ray.

Timing is critical for survival

- The 5-year survival rate for all patients is only 19%, which has not improved significantly in the past 10 years (NCI 2018)
- 70% of lung cancer is found at a late stage (stage III or IV) (Lemjabber-Alaoui 2015)
- A late-stage lung cancer diagnosis is associated with a 5-year survival rate below 5% (NCI 2018)
- Patients with screen-detected stage I lung cancer who underwent surgery within 1 month after being diagnosed demonstrated a 10-year survival rate of 92% (Henschke 2006)

Lahey: A case study in early lung cancer detection

- Began offering LCS in January 2012 as a community benefit program available to all patients at high risk for lung cancer
- Originated the Lung Imaging Reporting and Data System (Lung-RADS®), now managed by the American College of Radiology. Based on the BI-RADS® model developed for breast cancer screening, Lung-RADS® is a structured CTLS reporting system designed to ensure uniform reporting, efficient communication, and accurate data tracking of LCS findings
- CTLS database served as the framework for one of the most widely implemented CTLS program management systems in use today
- In conjunction with MeVis Medical Solutions AG,* developed a CTLS simulation environment "LungAcademy" to help train radiologists to read CTLS exams using Lung-RADS®
- The first facility in the United States to be designated an accredited LCS Center by the ACR. It has one of the largest clinical CTLS programs in the country
- Has shared its experience and standards/protocols, and has provided assistance to over 700 lung screening centers

*MeVis Medical Solutions AG develops innovative software for the analysis and processing of image data, contributing to the early detection and diagnosis of cancer.

Lahey results at a glance

Of approximately 5600 high-risk patients screened since 2012, over 200 have been diagnosed with lung cancer to date.

- A higher proportion of stage I cancers have been consistently detected compared with the national average
  - In 2017, 70% of lung cancers were detected at stage I—less than 10% were detected at stage IV

Source: Lahey Data on File.

2017 lung cancer diagnoses

Changing the LCS paradigm

Healthcare systems like Lahey, a multidisciplinary thoracic oncology center that diagnoses and treats lung cancer, are advancing early detection before symptoms appear.

Despite its proven mortality benefit, considerable barriers and limitations exist for lung cancer screening adoption

Simply stated, widespread uptake of LCS among high-risk individuals has been limited despite the potential of LCS to prevent many lung cancer deaths each year (Jemal 2017, Pastorino 2019, Worcester 2018).

According to the 2010 National Health Interview Survey (NHIS), only 2% to 4% of high-risk smokers received CTLS for LCS (Jemal 2017).

The low uptake in screening has become a concern and topic of discussion regarding lung cancer in the United States. This may be due to several perceived barriers and limitations:

- **Reaching the high-risk patient population has proven to be a challenge.** A 2014 survey found that many states in the U.S. with high rates of lung cancer incidence and mortality had limited screening capacity. This was particularly true in rural areas. 11 states did not have any CTLS centers (Zeliadt 2018). According to the Society of Behavioral Medicine, reaching high-risk patient populations will remain a challenge and may be exacerbated by discrepancies in implementation of high-quality screening (Zeliadt 2018).

  Outreach and access for LCS in the African-American community also continues to be a challenge. Despite having the same smoking rates as whites, African-Americans have the highest lung cancer mortality rates in the U.S. (Aldrich 2019).

- **Discrepancies in screening criteria.** Since the landmark NLST, multiple organizations have established guidelines on the use of CTLS. The most commonly referenced guidelines include:
  - U.S. Preventive Services Task Force (USPSTF)
  - American Cancer Society (ACS)
  - American College of Chest Physicians (ACCP)
  - American Association for Thoracic Surgery (AATS)
  - National Comprehensive Cancer Network® (NCCN®)

  Each set of recommendations varies slightly, which may create discrepancies between reimbursement policies and clinical practice. For example, the majority recommend screening for people between the ages of 55 to 74 years with a ≥ 30 pack-year smoking history and who either continue to smoke or have quit within the past 15 years. However, some recommendations extend the eligible age to 80 years. Other recommendations are based on the length and intensity of a person's smoking history (CDC 2018). These variations are explained by the way different organizations interpret study data. When deciding who should be screened for lung cancer, it may depend on which guidelines are being used.

- **Lack of public and physician awareness of the power of CTLS to detect early-stage lung cancer.** Research has shown that physicians and patients often lack awareness of CTLS and eligibility criteria (Klabunde 2010, MacMunn 2017). A study of multiple types of primary care physician (PCP) practice settings found that 62% of surveyed PCPs have low LCS knowledge, defined as missing 3 USPSTF/CMS screening eligibility criteria (Lewis 2019). Furthermore, PCPs with low LCS knowledge were less likely to refer their patients for CTLS. There may be different reasons why PCPs are not aware of or do not adhere to current guidelines. However, increasing provider knowledge may help facilitate the identification of appropriate CTLS candidates (Lewis 2019).

The general population also needs to be aware of the option of LCS. The Lung Health Barometer, a recent survey conducted among high-risk Americans, found that 84% were unfamiliar with CTLS screening and its availability (MacMunn 2017).

- **Concerns about radiation associated with CTLS.** Another common concern regarding CTLS is radiation exposure. According to the Health Physics Society, levels of radiation below 50-100 mSv, which includes most diagnostic imaging procedures, present health risks that are either too small to be observed or are nonexistent. To put this in perspective, the average effective radiation dose used per screening in the NLST was 1.5 mSv (NLST 2011). In clinical practice, radiation levels are typically even lower at approximately 0.7 mSv per screening, or about half the radiation exposure used in the NLST (McKee 2015a).

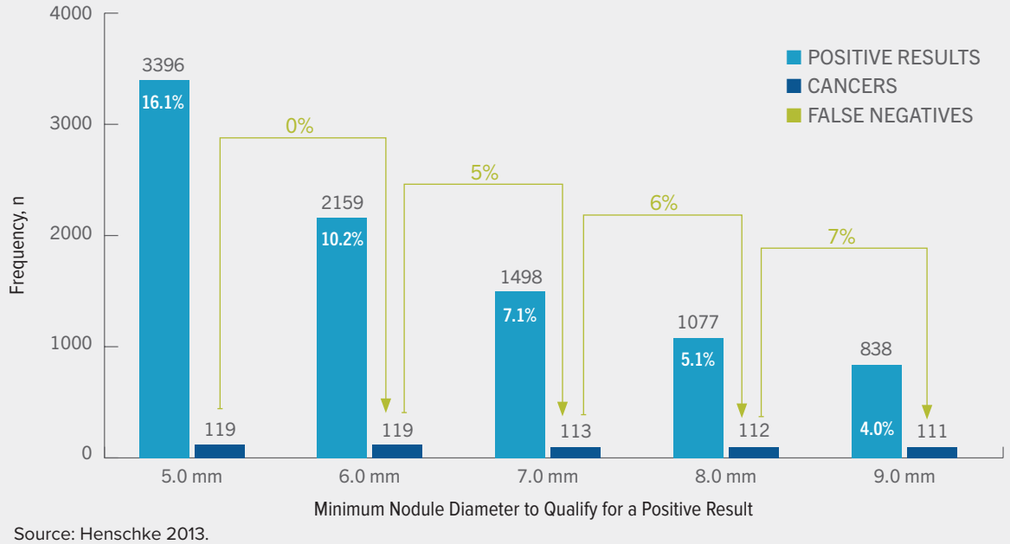
- **Concerns about false positives.** Additional concerns have been raised that CTLS can yield a high rate of false-positive results, which may incur additional cost, anxiety, and morbidity associated with cancer treatment (Patz 2014). The medical community predominantly refers to and cites the NLST for guidance on false positives. However, knowledge about lung cancer screening protocols has grown since the NLST.

  Standardization of reporting and management of screening results using quality assurance tools such as the Lung-RADS® has helped to address these concerns and vastly reduce the number of false positives demonstrated in the NLST.

  Determining the appropriate nodule size has shown to be an important factor in reducing false positives.

  Although the NLST specified a nodule size of 4 mm

Frequency of positive results and diagnosis of lung cancer among 21,136 participants within 1 year



Source: Henschke 2013.

- Increasing the nodule threshold from 5.0 mm to 6.0 mm resulted in the same number of lung cancer cases diagnosed within 1 year of the initial screening (Henschke 2013)
  - This translates to an absolute reduction of approximately 6% in positive results with no increase in missed diagnosis of lung cancer
- Lahey reported a similar positive rate of 10.5% when retroactively applying the current Lung-RADS® positive nodule size threshold (6.0 mm) to 1603 baseline screenings performed during the first 24 months of their program (McKee 2015a)

as the threshold for a positive study result, current Lung-RADS® recommendations call for a nodule size of 6 mm as the threshold for a positive study result (McKee 2015b).

Applying Lung-RADS® criteria

- When Lung-RADS® criteria were applied retrospectively to the NLST dataset, false-positive screening results were markedly reduced from 23.3% overall to 7.8% (average of baseline and subsequent screenings). There were smaller corresponding reductions in sensitivity of 13.1% overall (Pinsky 2015)
- Another study, the 2013 International Early Lung Cancer Action Program (I-ELCAP) study, reported:
  - No new false negatives within 1 year and a positive rate of 10.2% when increasing the positive nodule size threshold from 5 mm to 6 mm, similar to Lung-RADS® (Henschke 2013)
  - No delay in cancer diagnosis up to 9 months with a 6-mm threshold (Henschke 2013)

- **Concerns over false negatives.** False-negative results (i.e., showing no cancer present when there actually is) may cause a delay in seeking medical care if symptoms are present or worsening. In Lahey's experience, retroactively applying Lung-RADS® to their 2012-2014 results increased the positive predictive value in those screened by a factor of 2.5, to 17.3%, without increasing the number of examinations with false-negative results (McKee 2015b).

- **Limitations of screening criteria.** Screening is only appropriate for individuals at high risk for lung cancer. However, many people defined by the NCCN to be at high risk for lung cancer fall outside of current CMS and USPSTF age and smoking history eligibility requirements (NCCN 2019, CMS 2018, USPSTF 2013) and may not be reimbursed for CTLS (see next page).

  Former smokers who quit within 15 years were less likely to meet all screening criteria, with only one-half meeting the quit-time criterion (Wu 2016). However, lung cancer risk has been shown to persist beyond 15 years after smoking cessation (Tindle 2018).

Compared with whites, fewer African-Americans at high risk met screening eligibility criteria due to having less tobacco exposure and being younger when diagnosed (Aldrich 2019).

> ***"The bottom line is that [lung cancer] screening needs to increase among high-risk patients and the criteria used to identify high risk are still not inclusive enough."***
>
> —Andrea McKee, MD
> Chairman of Radiation Oncology, LHMC

- **Shared decision-making (SDM) requirement.** SDM is a collaborative process that allows patients and providers to make healthcare decisions together, taking into account the best scientific evidence available as well as the patient's preferences and values (McKee 2015a).The Centers for Medicare & Medicaid Services (CMS) requires that SDM is documented for proper reimbursement (CMS 2018). Although SDM is a beneficial part of the LCS process, it can be seen as an added step, which is not required for other cancer screenings, such as mammograms for breast cancer.

- **Understatement of primary and collateral benefits of CTLS.** With continued annual screening of patients at high risk for lung cancer, the mortality benefit shown in clinical practice is estimated to be significantly higher than the mortality benefit demonstrated by the NLST. A recent study has shown that screening beyond 5 years can improve the benefit of early detection and reduce lung cancer mortality by 58% (Pastorino 2019). Significant incidental findings, including non–lung cancer (1 extrapulmonary malignancy for every 7 lung cancers diagnosed), are another benefit of CTLS (Rampinelli 2011).

  An important byproduct of CTLS is the motivational and psychological effects a diagnosis can have on high-risk smokers. There has been a tendency for some to believe that a negative screening result would provide a license to smoke. However, new research demonstrated that high-risk smokers who undergo CTLS are more likely to quit smoking (Brain 2017). A decrease in the rates of smoking relapse was also shown among recently quit smokers (Townsend 2005).

- **The emotional, financial, and physical toll** patients and their families must endure after an incurable lung cancer diagnosis is vastly underrepresented (Cancer Care 2018).

- **Stigma associated with smoking.** There may be a stigma associated with LCS, as the disease is attributed to heavy smoking, a modifiable risk factor. Stigma may deter the at-risk population from seeking screening if a cancer diagnosis will result in confirmation of a poor lifestyle choice. This has been described as the "ostrich effect," a term recently coined to describe frightened patients who, when faced with a major health problem, want to "stick their heads in the sand" and not address the problem (Davenport 2018). However, the reality is lung cancer is not the only life-threatening disease that results from a poor lifestyle choice.

The LCS reimbursement landscape

Although reimbursement has been historically a challenge, both private insurers and Medicare now offer coverage for LCS among eligible high-risk individuals who meet all the eligibility criteria.

Medicare beneficiaries must meet all of the following criteria for LCS (CMS 2018):

- Ages 55 to 77
- Asymptomatic (no signs or symptoms of lung cancer)
- Tobacco smoking history of at least 30 pack-years (one pack-year = smoking 20 cigarettes [one pack] per day for one year, or 40 cigarettes per day for half a year, and so on)
- Be a current smoker or one who quit within the last 15 years
- Receive a written order for CTLS from a doctor following an SDM visit

Medicare also requires a written order for an individual's first CTLS screening obtained during an LCS counseling and SDM visit. The Affordable Care Act requires private insurers to cover LCS for people at high risk who fit the criteria above and are between the ages of 55 and 80 years (Li 2018, Levitan 2014).

LCS challenges can become opportunities

By studying well-established CTLS programs, and learning from their experiences, it is possible to collectively accelerate the learning curve and continue to build momentum.

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for CTLS screening (NCCN 2019)

Group 1 (NCCN Guidelines® Category 1 recommendation)*	• 55-77 years of age, ≥30 pack-year smoking history, quit <15 years
Group 2 (NCCN Guidelines Category 2A recommendation)*	• Aged 50 years and older, ≥20 pack-year smoking history • Additional risk factors (other than second-hand smoke) that increase the risk of lung cancer to ≥1.3%, such as: - Personal history of certain cancers or lung disease - Family history of lung cancer - Radon exposure and occupational exposure to carcinogens • *CTLS is not commercially reimbursed for Group 2*

According to the NCCN, expanding Group 1 to include those age 50 or older with a 20 or more pack-year smoking history and additional risk factor(s), excluding secondhand smoke, may save thousands of lives (NCCN 2019).

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LCS critical success factors

1. Resource determination
2. Multidisciplinary alignment
3. Centralized tracking and decentralized referral
4. Radiologist training/credentialing
5. Extensive continuing medical education (CME) outreach campaign for in-network physician groups
6. Effective and collaborative PCP/patient engagement and utilization of patient navigators
7. Employing effective and timely communication tools
8. Integrated smoking cessation

1. Resource determination

Lahey did not have substantial financial resources prior to starting the CTLS program, and did not participate in any LCS trials. Therefore, LCS infrastructure required building from the ground up. It was also essential to quantify the affected population and assess the operational feasibility of the program prior to implementation (McKee 2014).

The screening program was provided as a community benefit at no cost to high-risk patients (per 2012 NCCN Guidelines* with several additional criteria).

2. Multidisciplinary alignment, including PCPs

A cornerstone of Lahey's approach has been multidisciplinary alignment and buy-in. For example, it was essential to establish partnerships between PCPs and the radiology department. The program required the primary care team and/or referral base to partner with radiology to identify, inform, and follow all eligible patients through the screening process (McKee 2014). This kept the primary care team invested, informed, and motivated to continue referring patients for LCS.

3. Centralized tracking and decentralized referral

Enrollees in LCS programs may undergo dozens of examinations over a period of decades. A centralized program management system helps ordering physicians keep track of patients and is one of the primary responsibilities of the program's operational staff. Lahey's CTLS database was used as a framework for the development of a widely utilized CTLS program management system, which alerts staff when appointments are due or have been missed, and enacts protocols to notify patients and referring physicians of results and appointments (McKee 2015a).

At Lahey, the supervising radiologist regularly checks all reading radiologists' reporting metrics to identify outliers, which could indicate a need for additional training.

Because a multidisciplinary care team cannot see every patient, the role of PCPs in the LCS process cannot be overstated. The PCP provider base represents an established and experienced, decentralized preventive care network that is essential to referring patients and operating a low-cost, high-volume screening program (McKee 2013).

4. Radiologist training/credentialing

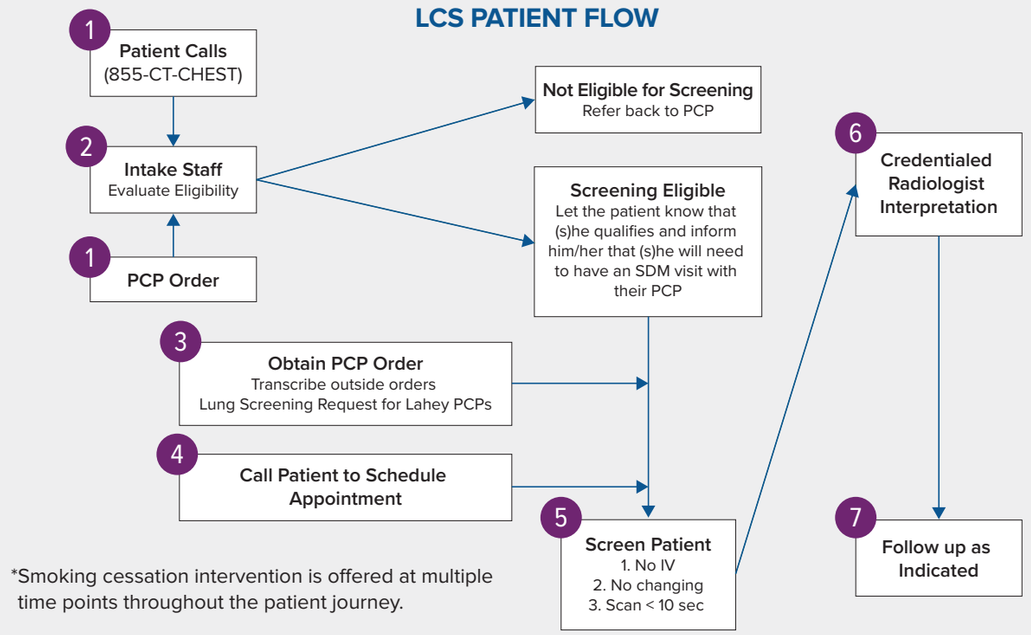
Lung-RADS® also facilitates structured, focused training. Comprehensive training for radiologists to correctly read and code CTLS findings was a critical component of ensuring consistency and quality control. This is facilitated by the MeVis AG LungAcademy software platform, which requires scored reviews of over 100 cases derived from the Lahey CTLS program, as well as a series of multiple-choice questions based on included reading material and video lectures. Radiologist reading metrics such as rate of negative, positive, and suspicious cases are reviewed quarterly. At Lahey, radiologists interpreting CTLS exams must read over 150 cases per year to maintain their credentials (McKee 2015a).

5. Extensive continuing medical education (CME) outreach campaign for in-network physician groups

A recent study of PCPs from a wide range of practice settings demonstrated a knowledge gap in familiarity with LCS guidelines, which could also be a barrier to successful LCS program implementation (Lewis 2019). Understanding LCS guidelines was found to be associated with a higher likelihood of discussing LCS with patients, utilization of LCS, and referral to an LCS program (Lewis 2019).

*Current 2019 NCCN Guidelines differ from 2012 as some criteria (e.g., age) have changed.

The patient journey through Lahey's LCS program*



*Smoking cessation intervention is offered at multiple time points throughout the patient journey.

Screening and eligibility

1 Most enrollees in the Lahey CTLS program are referred for screening after engaging in an SDM process with their PCP.
OR if the patient and PCP together decide that screening is appropriate, the PCP will order the examination and refer the patient to contact the lung cancer screening phone line (1-855-CT-CHEST) to confirm eligibility.

Entering new patients

2 All intake information recorded by the CT schedulers is entered into the screening database.

Instructions before examination

3 Obtain PCP order, if not received already, and assign a Lahey PCP if needed.

4 At the time of examination scheduling, patients are given detailed instructions regarding what to expect on the day of their examination.

Day of appointment

5 The patient checks in at the CT office before his or her examination. Appointments are booked every 10 to 15 minutes, but only several minutes may be necessary, as the patient typically does not need to change clothing for the examination. Metal, such as zippers or buttons, cannot be worn over the patient's chest. In these cases, the patient would be asked to change into a hospital gown from the waist up.

Capturing results

6 All interpreting radiologists are internally credentialed and use the Lung-RADS® for examination interpretation, which is essential to ensure quality (McKee 2013, 2015a).

Lung-RADS® Category	Patient Notification
1 and 2	Patients with negative or benign-appearing findings are sent a letter stating, in patient-friendly language, that their examination showed no evidence of clinically active disease and gives a specific date in 12 months' time when the patient should try to schedule the next screening.
3	Patients with positive but likely benign findings receive a letter stating that their examination found one or more probably benign lung nodules, with a follow-up examination recommended in 6 months.
4	The radiologist personally notifies the ordering physician of all suspicious findings and recommends formal pulmonary consultation. The ordering physician will personally notify the patient of the results and arrange for consultation with a pulmonologist of their choosing.

Patient contact after appointment

7 Two weeks after sending the examination results, the program navigator calls the patient to make sure they have been notified of the results (McKee 2015a).

Lahey's CME outreach campaign consisted of (McKee 2015a):

- Conducting live CME activities with local PCP groups
- Presenting facts from the NLST
- Detailing the risks and benefits specific to LCS
- Explaining opportunities to integrate smoking cessation counseling

6. Effective and collaborative patient engagement and utilization of patient navigators

Utilizing SDM decision aids and various forms of patient communications keep patients engaged throughout the screening process. Evaluation of SDM models include patient-reported satisfaction and patient adherence to recommendations.

A post-examination survey found a 98% overall likelihood to recommend screening to others. In addition, annual screening compliance approaches 90% (McKee 2015a).

Another critical factor in Lahey's program design was employing a patient navigator, who plays a pivotal role in screening and coordination of services:

- Works directly with physicians and patients to provide SDM and educational materials
- Acts as a point person for patients to address questions/concerns and guide them through various stages of the screening process

7. Employing effective and timely communication tools

Genentech and Lahey collaborated to develop communication tools for **Think. Screen. Know.**, an initiative dedicated to raising LCS awareness and reducing stigma associated with lung cancer.

- Lahey supplies patients and healthcare providers with decision aids in the form of written and verbal communications, including telephone and e-mail access to knowledgeable program personnel at multiple time points before enrollment
- A variety of online education materials and resources were created and made readily available for Lahey staff and patients participating in the program
- Community outreach is also utilized as a decision aid. Presentations at regional councils on aging, veteran's groups, military bases, professional firefighters associations, semiprofessional baseball events, rotary clubs, chambers of commerce, health fairs, cancer walks, and lung advocacy events are all part of Lahey's community outreach efforts (McKee 2015a)

8. Integrated smoking cessation

According to the USPSTF, smoking cessation is the most important intervention to decrease the morbidity and mortality associated with lung cancer (McKee 2015a). Approximately 50% of individuals at high risk for lung cancer are active smokers and can benefit from smoking cessation (McKee 2015a). Compared with those who continue to smoke, smokers who quit for more than 15 years have an 80% to 90% lower risk of developing lung cancer (Dela Cruz 2011).

Quitting age is also an important factor. Those who quit after age 50 have a lower risk of lung cancer death compared with current smokers; however, their risk rises significantly at about age 75 (Halpern 1993).

CTLS helps people quit smoking

A crucial byproduct of CTLS is its effect on smoking cessation rates:

- Since CTLS is an annual test commitment for the patient, screening programs inherently create recurrent set time points for participants to engage with members of the healthcare staff for the sole purpose of preventing lung cancer death
- Many view CTLS as a "teachable moment" that can improve smoking cessation rates (McKee 2015a, Borondy Kitts 2016)
- Offering smoking cessation interventions as part of annual CTLS is estimated to improve overall screening cost-effectiveness by 20% to 45% (Villanti 2013)
- It has been shown that interventions as brief as 3 minutes can increase cessation rates significantly (McKee 2015a)
- Smoking cessation rates in Lahey's CTLS program are 2 to 3 times the national average (Borondy Kitts 2016)

RESULTS SUMMARY

Lahey continues to detect proportionately more early-stage cancers than late-stage cancers each year compared with the national average

Usually symptoms of lung cancer do not appear until the disease is already at an advanced, non-curable stage. Even if symptoms appear, many people may mistake them for other problems, such as an infection or long-term effects from smoking. Lahey has been able to significantly increase the proportion of patients that are diagnosed at earlier stages (stage I/II).

- In 2017, Lahey detected 70% of lung cancers at stage I—less than 10% were detected at stage IV

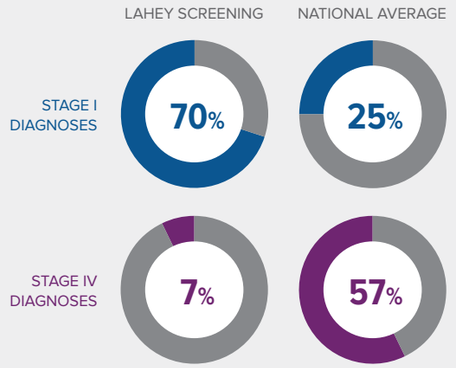
CONCLUSION

It's about time

We live in an unprecedented era of advancement—not only in how cancer is treated, but also how cancer treatment is perceived. If lung cancer is detected earlier, there is an opportunity for surgical treatment or SBRT with curative intent. For patients who are at high risk for lung cancer, time is of the essence.

The U.S. Preventive Services Task Force recently concluded that deaths due to lung cancer are significantly reduced by CTLS in healthy individuals with an elevated risk for lung cancer (Humphrey 2013). Of the lung cancers that Lahey discovered with CTLS, 70% were found in stage I, which is associated with better prognoses.

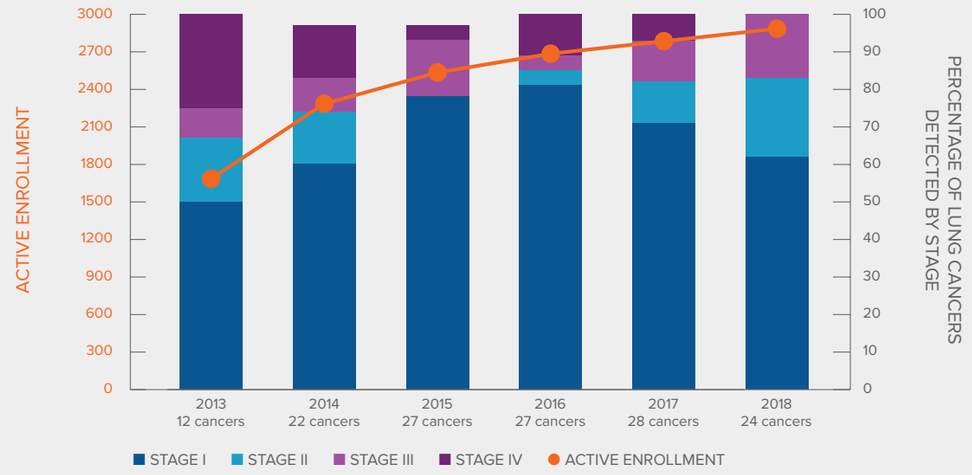
Proportion of stage I and stage IV diagnoses in 2017



At Lahey, 70% of lung cancers have been detected in the earliest and most treatable stage.

Sources: Lahey Data on File, LungCancer.net 2017, Lane 2016.

Active enrollment and lung cancers diagnosed by stage from 2013-2018*†



*2018 results are YTD, consisting of diagnoses and enrollment data from January-October 2018.
†3 cancer diagnoses were detected in 2012 due to lower patient enrollment (program initiation year).

As program enrollment and duration have increased, so has the trend of diagnosing a higher proportion of early-stage to late-stage lung cancer.

Source: Lahey Data on File.

Lung cancer is responsible for more deaths in the United States than the next three leading types of cancers combined, yet LCS has been lagging behind screening of other deadly cancers, all of which already have established screening interventions. The lack of screening enrollment is concerning given the magnitude of the mortality benefit and published evidence of significant pre-existing interest among primary care physicians in screening patients at high risk for lung cancer (McKee 2014, NLST 2011).

Raising awareness

Healthcare provider awareness—healthcare providers need to be aware of the options available and be confident in the screening process. An important step in evolving CTLS programs and improving utilization of CTLS for high-risk current and former smokers is to educate PCPs regarding CTLS guidelines and updated benefits of screening, including the low false-positive rate when using modern reporting systems (Raz 2017).

General population awareness—the general population also needs to be aware of the option of LCS. The American Lung Association, in partnership with the Ad Council, recently launched "Saved By The Scan." This public awareness campaign urges everyone to learn more about lung cancer screening. In addition, Genentech's lung cancer project **Think.Screen.Know.** provides patients and healthcare providers with educational materials that can be used as part of the SDM process and help support successful annual LCS.

> ***"This shift from [diagnoses of] late to early stages has tremendous implications for survival rates and patient care overall."***
>
> —Andrea McKee, MD
> Chairman of Radiation Oncology, LHMC

Momentum is building for improved outcomes

Successful screening programs like Lahey have demonstrated that as screening volume increases, so does the chance of detecting lung cancer at earlier stages compared with the national average. The difference can be lifesaving.

DISCLOSURES

Genentech and Lahey Hospital & Medical Center were involved in the development of this lung cancer screening paper. Genentech did not engage with patients directly and did not have access to identifiable patient data. Lahey Hospital & Medical Center authors received no honoraria from Genentech. None of the authors have any conflicts of interest to declare. All authors made substantial contributions to this manuscript.

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RESOURCES

American Cancer Society (ACS)
https://www.cancer.org/health-care-professionals/american-cancer-society-prevention-early-detection-guidelines/lung-cancer-screening-guidelines.html

American College of Radiology (ACR)
https://www.acr.org/Clinical-Resources/Reporting-and-Data-Systems/Lung-Rads

American Lung Association
https://www.lung.org/assets/documents/lung-cancer/lung-cancer-screening-report.pdf

American Society of Clinical Oncology (ASCO)
https://www.asco.org/search/site/lung%20cancer%20screening?f%5B0%5D=fctSiteName%3AASCO.org&f%5B1%5D=fctSiteName%3AMeeting%20Library

American Thoracic Society (ATS)
The American Thoracic Society and American Lung Association Lung Cancer Screening Implementation Guide:
https://www.lung.org/assets/documents/lung-cancer/implementation-guide-for-lung.pdf

Lahey Hospital & Medical Center
https://www.lahey.org/lungscreening

NCCN Clinical Practice Guidelines In Oncology (NCCN Guidelines®)
https://www.nccn.org

Society of Thoracic Radiology (STR)
http://thoracicrad.org/?portfolio=screening

United States Preventive Services Task Force (USPSTF)
https://www.uspreventiveservicestaskforce.org

Think.Screen.Know.—Genentech's lung cancer awareness and education initiative.
https://www.thelungcancerproject.org