

## *The Challenge of Lung Cancer*

Despite important advances in the treatment of lung cancer, it continues to account for more cancer deaths than colon, prostate, breast, and pancreas cancer *combined*. In 2012, an estimated 155,000 Americans and 1.3 million people worldwide will die from lung cancer. This alarmingly high mortality rate reflects a number of lung cancer's important features: the prevalence of its risk factors, its insidious onset, and its aggressive biology.

Smoking remains the clearest and most important risk factor for development of lung cancer; it is implicated in nearly nine out of ten new cases. A person's risk for developing lung cancer rises as their smoking exposure (expressed as "pack-years," the number of years a person has smoked, times the number of packs per day smoked; thus a two pack per day smoker for twenty years would have a forty pack-year exposure) rises. Quitting smoking steadily decreases risk of developing cancer for about fifteen years, after which the quitting benefit plateaus. Moreover, an "ever smoker" will still have at least twice the risk of developing lung cancer as a "never smoker," no matter how long ago he or she quit.

Despite this strong link to smoking, lung cancers can also occur in nonsmokers; indeed, this group represents a growing segment of lung cancer patients, especially women. There is a body of evidence that suggests that lung cancer in never smokers is a biologically distinct entity from lung cancer in smokers, and that different therapeutic agents may be more effective in this population. Other etiologic factors in this population may include radiation exposure (including therapeutic radiation), radon exposure, exposure to certain environmental toxins, pulmonary fibrosis, and genetic factors. Despite these considerations, the possibility of exposure to *secondhand smoke* must be considered.

In the strong association between smoking and lung cancer lies a small piece of encouraging news: the slightly decreased incidence of lung cancer over the last ten years is hypothesized to be related to a similar small, earlier decrease in smoking rates. While this association is difficult to fully attribute because of the long between exposure (smoking) and development of cancer, it highlights the potential benefits of education and policy programs aimed at curbing smoking.

The frequent absence of the most common presenting symptoms of lung cancer is testimony to its insidious onset, and this has meant that many patients do not seek medical attention until disease is advanced enough to cause symptoms. The late presentation of lung cancer patients nationwide is reflected in our own statistics at the Alvin and Lois Lapidus Cancer Institute: nationwide, over 50% of lung cancer patients present with stage IV disease; at the LCI, that number is 35.8% [insert graph]. The absence of heralding symptoms has also underscored the need for effective lung cancer screening; while this goal has proven elusive, as discussed below, 2010 brought the first clear evidence that lung cancer screening is effective in a high-risk population.

Tumor biology represents, in many senses, a catch-all phrase for an as yet incomplete understanding of how different types of cancer behave in the human body. While the mechanisms of tumor growth and spread remain active areas of investigation, clinical practice of oncology has allowed us to observe the natural histories and predict the behavior of many different types of cancer. In this regard, lung cancers tend to behave more aggressively than many other types of cancer – that is to say, they grow more rapidly in the lung and airway, and spread more quickly to other sites in the body.

These sobering facts characterize lung cancer, and set the challenge for our treatment of it. They represent the main obstacles to our achieving long-term survival in our patients. They also present a different, less obvious challenge: a fatalistic attitude toward treatment of lung cancer and toward the outcomes of that treatment. But while its statistics can be discouraging, lung cancer, like many other

types, can be treated well and even *cured* in its early stages. At the LCI, we are working the manifold frontiers of lung cancer care to achieve long-term survival and quality of life for our patients.

### ***Types of Lung Cancer***

While there are various histologic subtypes of lung cancer, the vast majority can be categorized as *non-small cell lung cancer* (NSCLC) or *small cell lung cancer* (SCLC); in fact, these categories account for 98.9% of lung cancers. Within the larger NSCLC category, the most prevalent histologies are *adenocarcinoma* and *squamous cell carcinoma*, in that order. The relative incidences of these subtypes in the United States is 38.5% adenocarcinoma, 20% squamous cell carcinoma, and 13.6% small cell carcinoma.

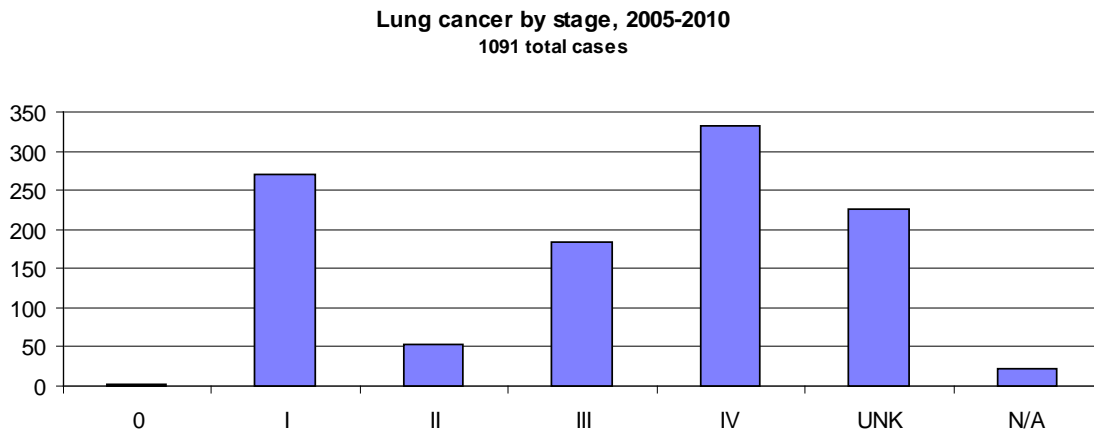
While our understanding of the behaviors of these various subtypes is continually being refined, it is clear that each demands its own treatment strategy. With the multidisciplinary approach to lung cancer treatment championed at the LCI, we are able to offer each patient the nuanced care he or she needs, as demanded by the type of disease, overall health, and other considerations unique to each patient.

### ***Diagnostic Modalities***

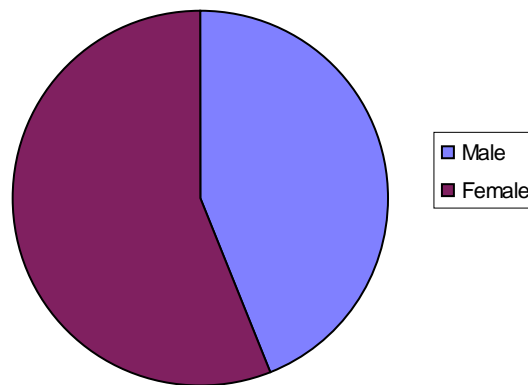
The diagnostic workup for lung cancer may include any of a number of modalities. Our “decision tree” is informed by National Comprehensive Cancer Network (NCCN) guidelines, tailored to each patient. Beyond the usual CT scan, workup modalities may include positron emission tomography (PET) scan, ultrasound-guided biopsy, or surgical staging mediastinoscopy. All of these diagnostic modalities – invasive and non-invasive – are offered on-site at LifeBridge Health. In this way, we are able to ensure that each patient receives a state-of-the-art workup in a timely manner with minimal risk of “loss to follow-up.”

### ***LCI: On the Frontiers of Lung Cancer Care***

At the LCI, our team is active on the many frontiers of lung cancer care to optimize patient outcomes.



**Lung cancer by sex, 2005-2010**  
1091 total cases



On the **clinical care frontier**, our physicians are practicing oncologic care at the highest levels. Over the last several years, *targeted therapies* for lung cancer have come to represent an important class of medications for cancer treatment, and can help achieve remarkable outcomes. For patients whose tumors express certain molecular markers, these medications directly target those molecules to interfere with the growth and spread of cancer cells. For many patients, this direct strike at a molecular level can mean excellent oncologic outcomes with fewer of the side effects that have plagued many older-generation chemotherapeutics. A recent phase I trial of one such medication (crizotinib) in lung cancer patients showed that over half of the patients with the *ALK* molecular mutation who received the medication showed a complete or partial tumor response, compared to fewer than 10% of patients receiving standard second-line chemotherapy. Side effects were generally mild and low-grade. Our lung cancer care team has developed protocols to ensure that all appropriate lung cancer patients under our care are tested for these important molecular markers, to determine which of them may be candidates for this class of medications. Beyond the immediate outcomes they help achieve, these targeted therapies also represent an important step on the path to “personalized medicine.”

Advances have not been limited to the realm of medical oncology. Over the last several years, minimally invasive surgical techniques have come to offer a safe and oncologically-sound alternative to “traditional” open surgery. Our thoracic surgeons are skilled in video-assisted thoracoscopic (VATS) techniques of pulmonary resection. This minimally invasive approach to lung cancer surgery offers a faster discharge (often in as little as two days), less pain, and faster full recovery while preserving the oncologic outcomes of open techniques. By most estimates, fewer than 25% of lobectomies performed for lung cancer nationwide are performed thoracoscopically by board-certified thoracic surgeons. At the LCI, over 80% of resections for early stage lung cancer are performed thoracoscopically, by either of our two board-certified thoracic surgeons.

Robotic pulmonary resection represents the newest iteration of surgical approaches to lung cancer surgery. While this approach is less well-proven than VATS, it may offer certain advantages over VATS and open techniques. Our surgeons are among a few in the region with experience with the daVinci robot for lung cancer surgery.

The LCI’s capabilities in radiation oncology have similarly continued to grow. Our CyberKnife stereotactic radiation therapy center remains among the most active in the nation for thoracic oncologic

applications. Between 2009 and 2011, we performed over 60 CyberKnife treatments for lung cancer. Our CyberKnife program is unique in the collaboration between surgeon and radiation oncologist that characterizes it. Each patient undergoing CyberKnife for lung cancer is evaluated by both a surgeon and a radiation oncologist and, unlike in many programs, surgeons are actively involved in the treatment planning process. This collaboration brings the expertise of *two* specialists to the patient, and ensures that each patient benefits from the unique knowledge of each.

The Weinman Family Department of Radiation Oncology recently became the first in the mid-Atlantic region to acquire TrueBeam technology. This is the most sophisticated linear accelerator in the world developed on a single computer platform and is the only radiation treatment machine integrated into a single computer system. TrueBeam is able to treat 99% of external radiation patients with conventional 3-dimensional treatment, intensity modulated radiation therapy (IMRT), respiratory gating to minimize normal tissue treatment and stereotactic radiation therapy for high precision/high dose treatment. Combined with our CyberKnife stereotactic and brachytherapy programs, TrueBeam completes our state-of-the-art full-service radiation therapy department.

Our physicians continue to recognize that lung cancer is among the most challenging malignancies to treat; treatment can be grueling, and even the most determined patient-physician team cannot always overcome it. We continue to recognize that palliative care has a critically important role in cancer care. Indeed, there is a strong and growing body of evidence that well-applied palliative care regimens can have quality of life and even *survival* benefits. To that end, the LCI has added staff with interests and expertise in palliative medicine, and continues to offer a full range of medical and surgical techniques to palliate the symptoms of patients and families who have changed their goals of care from cure to comfort.

On the **programmatic frontier**, the LCI has continued proven programs that benefit lung cancer patients, and has become newly involved with others. The Multidisciplinary Thoracic Oncology Clinic remains the foundation of our lung cancer treatment efforts. Started several years ago, the Multidisciplinary Clinic comprises a medical oncologist, a radiation oncologist, a thoracic surgeon, and oncology nurses and nurse navigators. Each patient is evaluated by all three physicians; not only does this offer the benefit of convenience, but more important, ensures that each patient benefits from the expertise of each physician and from the synergy of having all of them work collaboratively to outline a treatment course. The LCI has continued this multidisciplinary approach to lung cancer care, with the patient at the center.

Through the Multidisciplinary Clinic, and as a center accredited by the American College of Surgeons Commission on Cancer, the LCI offers patients the opportunity to participate in many clinical trials, spanning across many cancer types. We are fortunate to have an active, dedicated team of research staff who work with clinicians to identify patients appropriate for clinical trials, and help with enrollment and participation of these patients. This access to clinical trials offers patients the most up-to-date treatment options, and distinguishes the LCI from other community cancer centers.

Recently, our Division of Thoracic Surgery was selected through a competitive application process as a participating site in the ProvenCare Lung Cancer Collaborative, an initiative of the American College of Surgeons Commission on Cancer. ProvenCare postulates that by controlling important elements of lung cancer care, improved outcomes can be achieved more efficiently and more cost-effectively. Sinai will be one of twelve sites nationwide participating in this landmark initiative, along with institutions like Duke, Geisinger, Northwestern, University of Washington and University of Massachusetts, to devise pathways to improve lung cancer outcomes around the country.

On the **detection frontier**, the last eighteen months have brought groundbreaking changes in lung cancer screening. For the first time ever, screening was found to have a survival advantage in a select population of patients. A trial sponsored by the National Cancer Institute found about 20% fewer lung cancer-related

deaths in heavy (>30 pack years) current or former smokers aged 55 to 74 who were screened with CT than in those screened with chest x-ray. Analysis of early results uncovered this significant difference and resulted in the study's early termination. CT scan detected more lung cancers, at an earlier and more treatable stage, and therefore reduced the number of deaths in high risk patients. Whether these findings are more broadly applicable is the subject of ongoing research. While Medicare and insurance companies have yet to adopt policies supportive of lung cancer screening, the LCI is exploring ways to bring the benefits of this new knowledge to our patients, through our own screening programs or through partnerships with primary care physicians.

On the **education frontier**, the LCI has recently launched a Speakers' Bureau to offer our expertise to the larger community. Our Bureau includes physicians from all disciplines of cancer care who have made themselves available for speaking engagements arranged through the LCI's Community Outreach Coordinator. Community education, for lung cancer and beyond, remains a paramount goal of the LCI, and our Bureau represents that commitment.

A lung cancer diagnosis is life-changing, and facing its treatment can be daunting to say the least. The LCI's program for lung cancer provides patients with the expert team to face the challenge with confidence and resolve. By operating along the spectrum of cancer care, from education and prevention, to treatment, to palliation, the LCI ensures that patients and family members receive the most expert, up-to-date, and compassionate care offered anywhere in the world.