Lung cancer is the second most common, and most fatal, type of cancer, accounting for almost 25% of all cancer deaths—more than breast, prostate, and colon cancer combined. In 2021, an estimated 235,760 people were diagnosed with lung cancer and 131,880 died of the disease. The overall five-year survival rate for those with lung cancer is only 21%. That's not surprising, since lung cancer doesn't present symptoms until the disease has reached an advanced state. Early-stage lung cancer is more readily treated, leading to a better prognosis. The five-year survival rate for lung cancers diagnosed at a localized state is 56%. Yet, only 16% of lung cancers are diagnosed in that state. For that reason, it's essential that medical assistants help patients reduce their risk of lung cancer and get screened whenever appropriate.

**Breathtaking Cells**

Lung cancer is defined as malignant cells (i.e., cancer) developing in lung tissue and multiplying uncontrollably. It usually originates in the cells lining the bronchi and parts of the lung.

There are two main types of lung cancer: non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). The different subcategories of lung cancer are assigned to these two main groups according to commonalities in treatment and prognoses.

Approximately 84% of lung cancers fall under the category of NSCLC. There are various types of NSCLC, each originating from different types of lung cells. Adenocarcinoma, which starts in cells that ordinarily secrete mucus...
“[SCLC] is a very aggressive type of lung cancer that tends to grow and spread quickly in the lung tissue,” says Conti. “These cells have the ability to rapidly divide and reproduce. It is thought that small cell lung cancer cells have mutations that inactivate tumor suppression genes, thus allowing the cells to grow quickly.”

Such fast-growing cancers typically respond well to chemotherapy and radiation therapy but usually return.\(^1\)

Cancers that begin in other organs can metastasize to the lungs, but these aren’t considered lung cancer, and treatment corresponds to wherever the cancer originated.\(^1\)

Lung tumors that fall outside the main categories include lung carcinoid tumors, which are slow-growing and are at the root of less than 5% of lung tumors; adenoid cystic carcinomas; lymphomas; sarcomas; and, rarely, benign lung tumors such as hamartomas. Treatment for these rare types of lung tumors differs from that for the more common types.\(^1\)

### Getting Wind of Cancer

Regardless of type, once symptoms of lung cancer finally do appear, they may include a persistent cough, coughing up blood, shortness of breath, headaches, pain in the bones, unintentional weight loss, hoarse throat, chest pain,\(^2\) wheezing, fatigue, loss of appetite, trouble swallowing, and swelling of the face and/or neck veins.\(^4\) Some people may feel a general malaise, and some may have recurring pneumonia or enlarged lymph nodes inside the chest, between the lungs.\(^4\)

Shortness of breath can result from cancer that has grown to the point of blocking the major airways or pleural effusion, which is fluid accumulation in the pleural space—the chest cavity space surrounding the affected lung.\(^2\)

Older people are more likely to have lung cancer: the average age of diagnosis is around 70 years.\(^1\)

### Where There’s Smoke ...

Cigarette smoking is to blame for 80% to 90% of lung cancer fatalities. Of the more than
7,000 chemicals in tobacco smoke, many of which are poisons, at least 70 have been identified as carcinogens. Cigarette smokers are 15 to 30 times more likely to get or die of lung cancer than nonsmokers. The risk of getting lung cancer increases with the daily number of cigarettes smoked and number of years smoking. Even minimal smoking increases the risk of lung cancer. Those who quit decrease their risk of cancer, but they are still more likely to get lung cancer than those who have never smoked. Other tobacco products also increase lung cancer risk.3

In the United States, an estimated 5,840 non-smoking adults were diagnosed as having acquired lung cancer through exposure to secondhand smoke in 2014.4

Genetic differences may make some people more susceptible to lung cancer if they smoke or are exposed to secondhand smoke.1

The second leading cause of lung cancer is radon exposure, which causes approximately 20,000 cases of lung cancer annually.7 Radon is a natural gas7 that is produced during the natural breakdown of uranium in soil, rock, and water.7 It mixes with our air7 and becomes trapped in buildings, including homes.7 Almost 1 in 15 homes in the United States is believed to have high concentrations of radon.7

Asbestos, arsenic, diesel exhaust, and certain types of silica and chromium can increase the risk of lung cancer—with some presenting a higher danger than smoking.7 These substances may be found at certain workplaces; arsenic may also be found in drinking water, mainly that from private wells.7 They especially increase the risk of lung cancer for smokers.2

Living in an area with a high level of air pollution8 and radiation therapy to the chest increase the risk of lung cancer, as can beta-carotene supplements for smokers.7

Smoking combined with one or more other risk factors increases the risk of developing lung cancer.6

Lung cancer survivors are at risk of recurrence, particularly if they continue to smoke, as are those whose immediate family members have had lung cancer.7

Not smoking is the best way to avoid getting lung cancer, as well as avoiding other carcinogens.

In fact, the number of new lung cancer cases in on the decline, partly due to the growing unpopularity of smoking.1 Deaths attributed to lung cancer have declined by 48% since 1990 for men and 23% since 2002 for women. That positive trend is picking up speed, and between 2012 and 2016, the rate decreased approximately 4% annually for men and 3% each year for women.5

Laws preventing smoking in public places have decreased lung cancer cases due to secondhand smoke and smoking in adults and youth. Non-smokers’ exposure to secondhand smoke declined in the U.S. from 84% during the period from 1988 to 1994 to 25% during 2011 to 2012. Still, such exposure is much higher for low-income nonsmokers.5

Sigh of the Times
Low-dose computed tomography (LDCT) is the only recommended screening test for lung cancer.9 LDCT produces a detailed image of the lungs using a low dose of radiation.9 Its 3-D images can detect very small tumors and ascertain whether the cancer has spread to the lymph nodes encircling the lungs.9 “[LDCT] protocol uses between 75% and 90% less radiation than the conventional CT,” says Ricardo E. Blanco, MD, FCCP, medical director for respiratory services and staff pulmonologist at St. Tammany Parish Hospital in Covington, Louisiana.

LDCT screenings have reduced lung cancer mortality by approximately 20% among current heavy smokers or former heavy smokers who have quit within the past 15 years.5 But while lung cancer must be caught early if it’s not to be fatal, overscreening can be an issue in and of itself.

Although the screening test is quick and painless, the test has risks.8 “Screening should be offered only to those healthy enough to derive benefit if a cancer is found,” says Dr. Blanco, also a diplomate of the American Board of Internal Medicine in internal medicine, pulmonary disease, critical care medicine, and sleep.

LDCT can result in a false-positive, leading to unnecessary follow-up tests and surgeries, all with their own risks.8 It may also lead to overdiagnosis, finding cases of lung cancer that are not bothering the patient and leading to unnecessary treatment.8 Finally, the radiation from multiple LDCT tests can, ironically, lead to cancer in the healthy.9 This is why only high-risk, asymptomatic individuals should be screened.8

In 2021, the U.S. Preventive Services Task Force widened its screening recommendations.3,8 The task force now recommends annual screenings for patients between 50 and 80 years of age who have smoked or quit within the past 15 years and have a 20 pack-year or more smoking history.3,8 A pack-year is defined as smoking an average of one pack of cigarettes daily for a year.9 For instance, 20 pack-years could mean smoking one pack a day for 20 years or two packs a day for 10 years.8

Other organizations offer their own screening recommendations with slight variations on these, sometimes including other risk factors.

Sometimes those who fall outside of these parameters should be tested. “Each patient may have an individual circumstance that warrants a lung screening and should be discussed with their primary physician to see if screening is appropriate for their individual history,” says Conti. “In my opinion, there are various levels of secondhand smoke exposure. If you feel that your exposure was significant, you should advocate for yourself by discussing your ability to get a low-dose screening with your primary care doctor.”

Screening should stop when someone turns 81, hasn’t smoked for 15 years, or develops a health issue that either reduces their life expectancy significantly or makes them a poor or unwilling candidate for surgery if lung cancer is indeed discovered.8

Still, for those at risk of having lung cancer who may benefit from treatment, annual screenings are worth it. “Yes, repeated low-dose over a period can result in cancer, but that risk is very low,” says Rashmi Benda, MD, a radiation oncologist with the Lynn Cancer Institute of Boca Raton Regional Hospital in Boca Raton, Florida. “And the benefit far outweighs any of that risk.”
Tobacco use and dependence is considered a chronic, relapsing condition. Patients who receive counseling and medication double their chances of quitting smoking successfully. Even brief counseling from a health care provider increases the likelihood that a patient will attempt to quit smoking.

Incorporating a tobacco cessation clinical intervention protocol can add as few as three minutes to a patient visit and can be accomplished by anyone on the clinical care team. First, ask patients about current tobacco use. If they respond that they don’t use tobacco products, discuss the dangers of starting to use them.

If they say they’ve quit in the past one to twelve months, ask about any challenges or ways that the clinical team can support attempts to quit. If they reply that they do currently use tobacco products, they should be advised to quit and their willingness to stop should be assessed.

If they are unwilling to quit at the time, the health care team should try to provide motivation to do so and express their willingness to help in the future. “Patients do not want preaching,” says Nancy L. Brown, CMA (AAMA), certified medical assistant/phlebotomist with Access Health Care Physicians in Fort Pierce, Florida, “but to know someone is there when they are ready.”

Those willing to quit should be provided assistance, whether through counseling, medication, or resources. A combination of behavioral counseling and medication is more effective than either of these treatments on their own. Patients should set a quit date that’s no more than 30 days into the future, and health care professionals should discuss potential withdrawal symptoms and triggers—and how to deal with each—with patients.

Following up either in person or via telephone is key. The first appointment should occur within a week of the quit date, while a second should follow within the first month of quitting. Donna Fontana, CMA (AAMA), a recently retired medical assistant in Connecticut, lost her father, a long-term smoker, to lung cancer. This led to her quitting her own smoking habit. She shared her experience quitting and the reason she quit with her patients who smoked.

“When given the opportunity, I would remind patients of the successful outcomes of treatments that I had the pleasure of witnessing and always looked for words of encouragement,” says Fontana, “even if it provided the patient a little bit of hope.”

Kicking the habit isn’t easy, and often takes multiple attempts and long-term support. “Some patients quit cold turkey, others over time, and still others will bounce back and forth with quitting,” says Brown. Yet, the effort is worth it: 3 out of 5 American adults who have ever smoked were able to quit in the end.
Après Screening

Once a suspicious mass has been observed on a CT scan, a biopsy is typically conducted to confirm whether it is indeed cancer. In a biopsy, small portions of the suspicious tissue or fluids are extracted. Usually, biopsies are performed on a lung tumor, but they may also be done on tissue from the chest lining or lymph nodes or on fluid from the chest cavity or lungs. Certain types of biopsy do not necessarily require removal of tissue or fluids, but use a small camera to examine the noted masses inside the body.

Studying the tissue under a microscope, a scientist can determine the cancer’s type and subtype.

Types of biopsies include needle biopsy or aspiration, bronchoscopy, autofluorescence bronchoscopy, endobronchial ultrasound mediastinoscopy, thoracentesis, thorascopy, electromagnetic navigation, and surgery. MRI can also be used to determine the presence of cancer and is the best instrument for determining whether lung cancer has metastasized to the brain. With positron emission tomography (PET), a special sugar solution is injected intravenously. If the solution collects at a site, cancer may be present there, as cancer typically uses more energy than other types of cells or tissue. This information shows whether lung cancer has metastasized to other parts of the body.

The size and location of the suspicious mass determines what type of biopsy is performed. “There are malignancy risk calculators that are available and help us determine how to proceed,” says Dr. Blanco. “The Mayo Clinic model is one of the most used and takes into account a patient’s age, diameter of the nodule, history of smoking, history of extra thoracic cancer greater than or equal to five years prior, location of the nodule in the upper lobe, appearance ..., and whether a PET scan showed hypermetabolic activity. This determines low, intermediate, or high risk. Low risk findings—<5% risk of malignancy—are followed in 6 to 12 months; intermediate risk—5% to 65%—is followed with a PET scan and, if a PET scan is not available, a nonsurgical biopsy. If the risk of malignancy is high, or >65%, then a surgical biopsy is recommended.”

Biomarker testing—sometimes called tumor, molecular, or genomic testing—tests tumor tissue for DNA abnormalities and levels of specific proteins. Changes in DNA include mutations, additions, deletions, or rearrangements. The DNA changes are not genetic but occur over time, sometimes in response to environmental factors, such as carcinogens, but can be random or with no known cause. During the biopsy, extra tissue should be extracted to perform biomarker testing if indicated.

If biomarker testing has not been done and may be useful, but no remaining tumor tissue is available, a clinician may do an additional biopsy or a liquid biopsy. Done via a regular blood draw, a liquid biopsy can quickly identify many different biomarkers and be used in conjunction with the tissue biopsy to identify appropriate treatment. Because lung cancer tumors can change in response to treatment, additional biomarker testing on either blood or tissue after treatment has begun can help redirect treatment for tumors that have become resistant to the existing therapeutic strategy.

Staging of cancer takes into consideration the growth and spread of the cancer, which is important in determining therapeutic strategies and the patient’s prognosis. The TNM staging system evaluates growth and spread via size or extent of the primary tumor (T), whether regional lymph nodes are involved (N), and whether there are distant metastases (M). Ratings go from Stage 0, meaning the cancer is in situ, to Stage I for cancer that is in its early state, and through Stage IV, advanced disease.

Air Support: Treatment

When deciding on a course of treatment, “we have to decide whether the cancer is resectable and whether the patient is operable,” says Dr. Blanco. “In general, Stages I and II are directed toward surgery. Stages III and IV require systemic therapy with chemotherapy or chemo-radiation.”

Early-stage NSCLC is usually treated via surgery, sometimes alongside chemotherapy, either on its own or combined with radiation therapy. Advanced-stage NSCLC is typically attacked with chemotherapy, targeted drugs (sometimes combined with chemotherapy), or immunotherapy. SCLC is generally treated with chemotherapy, either unaccompanied or combined with radiation. Many patients experience a brief remission through this course, although the cancer often returns.

Targeted Therapy

Tailored, or targeted, therapy has given renewed hope to some advanced lung cancer patients. Targeted therapies target the cancer cells with biomarker abnormalities that cause them to grow, reducing damage to normal, healthy cells. The list of biomarkers with treatments approved by the Food and Drug Administration (FDA) is growing.

“Since 2004, the number of actionable mutations has increased to the point that 1 in 5 or 1 in 6 non-squamous cell lung cancers can be treated with tailored therapy. This has been an exciting development in the treatment of lung cancer,” says Dr. Blanco. “When patients are found to have actionable mutations, they have a better response with less toxicity than if they received standard chemotherapy.”

Currently, markers targeted with FDA-approved treatments are epidermal growth factor receptor mutation, anaplastic lymphoma kinase gene rearrangement, ROS1 rearrangement, BRAF V600E mutation, NTRK gene fusion, MET amplification or MET exon 14 skipping, RET rearrangements, and KRAS mutation. These mutations are most common in patients with adenocarcinoma, a subtype of NSCLC. Biomarker testing is generally not done, therefore, for squamous cell lung cancer or SCLC, except in those who have never smoked.

Other gene changes are being studied in clinical trials.

Immunotherapy
“Immunotherapy has been the biggest game-changer in Stage III and Stage IV patients,” says Dr. Benda.  

Immunotherapy uses the power of the body’s immune system to attack cancer cells. While the immune system typically tackles harmful foreign agents in the body, it also knows not to attack the things that should be within the body, like organs. Lung cancer cells, as formerly normal lung cells, present a conundrum to the immune system because they still have some of their former attributes—although they have also acquired new features that make them harmful to the body. 

Immunotherapy drugs, administered via infusion, allow the body to recognize cancer cells as dangerous and foreign so that the immune system will fight them. 

Immunotherapy includes immune checkpoint inhibitors, which target molecules on the immune cells that should start or stop immune responses, depending on whether it recognizes something as normal or foreign, but which are sometimes eluded by cancer cells. Some inhibitors ensure the immune system fights cancer by blocking contact between the PD-L1 protein and PD-1 receptor on the T cell, as this contact can prevent the immune system from responding. One inhibitor blocks immune checkpoint CTLA4 to increase the number of immune cells available to fight cancer cells. 

Biomarkers can indicate the level of PD-L1 protein in tumors to determine whether a tumor may respond well to appropriate immunotherapy drugs. 

Immunotherapy “can be used by itself or together with chemotherapy and has shown progression free survival and improved overall survival in unresectable Stage III [NSCLC],” says Dr. Blanco. 

Real-Time Tumor Imaging  
Surgery and radiotherapy on lungs is particularly difficult because the object necessarily presents a moving target—lungs move up and down as the patient breathes. Four-dimensional CT takes a continuous scan of the chest for approximately 30 seconds, resulting in an image that shows where the tumor is in relation to other objects in the chest as the patient breathes. Surgeons and radiation oncologists can thereby predict more or less where the tumor will be at any given point in the course of respiration. 

Surgery  
There are four types of lung cancer surgery: wedge resection, where the tumor and some of the normal tissue surrounding it is removed (called segmental resection when a little more tissue is removed); lobectomy, when an entire lobe is removed; pneumonectomy, when an entire lung is removed; and a sleeve resection, when part of the bronchus is removed. 

Robotic-assisted surgery, in which the surgeon uses a control panel to move long surgical instruments via robotic arms, is being used in some operating rooms. 

Video-assisted thoracic surgery helps surgeons use smaller incisions for small lung tumors. 

Radiation  
Radiation therapy utilizes photons (high-energy X-rays) or protons (particle beams) to kill, shrink, or control the growth of tumors and prevent them from metastasizing. This therapy can also be used palliatively to reduce cancer symptoms. 

“I used to tell patients, ‘I can treat you with radiation because you can’t have surgery, but the best I can give you is maybe 50% local control,’” says Dr. Benda. “So, there’s about a 50/50 chance that this radiation is going to control your cancer.” 

Dr. Benda credits four-dimensional CT real-time tumor imaging and stereotactic body radiotherapy (SBRT), which she notes has been around for at least 15 years, for improving patients’ chances since that time. 

SBRT, also known as stereotactic radiotherapy or stereotactic ablative radiotherapy, directs radiation very precisely, targeting the tumor while avoiding nearby healthy tissue. SBRT is usually delivered over one to five sessions. Fiducials (gold markers), usually placed during an outpatient procedure, can help guide radiation to the tumor during SBRT. 

“CyberKnife is one of the machines that we do it on,” Dr. Benda notes. “The advantage of CyberKnife is that it can latch onto the tumor, either by just seeing the tumor or gold markers, and [the machine] can track [the tumor] with the breathing. That allows me to treat a small area, and therefore I can give it a very high dose, and that’s more ablative. Previously, we couldn’t give it as high a dose because we were treating a bigger area. Now, with the newer techniques, we have higher doses and a smaller target, treated over a very short period. Now, it’s about one week compared to six to eight weeks. Control rates have gone above 90% for tumors that are two centimeters or less. That’s a big, dramatic improvement.” 

There are additional brands of SBRT devices. 

External Beam Radiation therapy, in which radiation enters the body through the skin, can be done via the following: 

- 3-D conformal radiation therapy, which uses imaging scans to map the tumor before delivering a steady stream of photon radiation to it 
- Intensity-modulated radiation therapy, in which the radiation strength is varied 
- Image-guided radiation therapy, which uses imaging during therapy 
- Particle beam therapy, which is currently used in only a small group of cancer centers 

In brachytherapy, also known as internal or implant radiation therapy, radioactive material is sealed in needles, seeds, wires, or catheters that are placed in or near the tumor. 

Brain metastases are common in lung cancer patients. Radiation can target them or be used to prevent them. 

Chemotherapy  
Chemotherapy uses chemicals to kill cells that divide or grow rapidly, but normal, healthy cells that also divide and grow rapidly often get caught in the crosshairs, unfortunately.
“This is a very exciting time in lung cancer research,” says Christine J. Conti, RN, ONN-CG. “In the past 10 years, many new treatment options have become available for lung cancer patients. Targeted therapy and immunotherapy have greatly improved that prognosis in lung cancer patients. Genetic and molecular testing have become increasingly helpful in the treatment of lung cancer as well.”

In late May of this year, Amgen received FDA approval for a pill that targets the KRAS mutation—one of the most common mutations, but one that had eluded treatment for so many years that researchers considered it “undruggable.”

No FDA-approved vaccines specifically for lung cancer exists yet, but are in clinical trials. Rather than prevent cancer, cancer vaccines are therapeutic, improving the immune system’s ability to kill cancer cells. They may do this by targeting an individual’s unique cancer proteins or those shared by many people.

Also being studied in clinical trials, but not yet FDA-approved, is adoptive T cell therapy. T cells—a type of white blood cell found in the immune system—are removed from the body through plasmapheresis and modified in a laboratory to enhance their proficiency at attacking a person’s specific cancer cells once they’re reintroduced into the body.

“With each clinical trial providing more and more treatment options,” says Conti, “there is more and more hope that we can control this disease.”

Initial chemotherapy is also called first-line chemotherapy. Additional rounds are called second-line chemotherapy. Drugs used may include platinum-based drugs such as cisplatin or carboplatin plus an additional medication, such as paclitaxel (Taxol), docetaxel (Taxotere), etoposide (VP-16), gemcitabine (Gemzar), or vinorelbine (Navelbine). Pemetrexed (Alimta) and bevacizumab (Avastin) may be used instead or in combination with the above.

Neo-adjuvant chemotherapy is used before another treatment, usually to shrink the tumor to a point where surgery is possible, and adjuvant chemotherapy refers to chemotherapy used after another treatment, usually to kill any remaining cancer cells after surgery.

Chemotherapy patients may receive maintenance chemotherapy after their initial treatment of four to six cycles. Maintenance therapy involves an additional four to six cycles with a single chemotherapy or targeted drug. This extended treatment may lengthen some patients’ life-spans, but the side effects may make maintenance therapy untenable for others.

Advances in treatment and screening are improving mortality rates for cancer patients, but more can be done from the front-end.

“We need to ramp up screening,” says Dr. Benda. “It has not become part of our culture, like mammograms for women or [prostate-specific antigen] levels for men. It’s time we educate the public that these CT scans are something that are helpful and can save lives.”

References


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