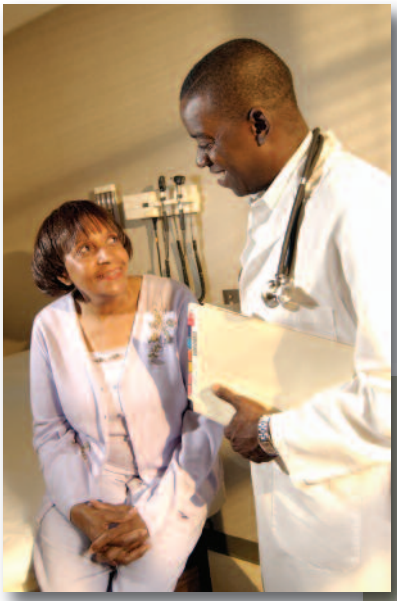
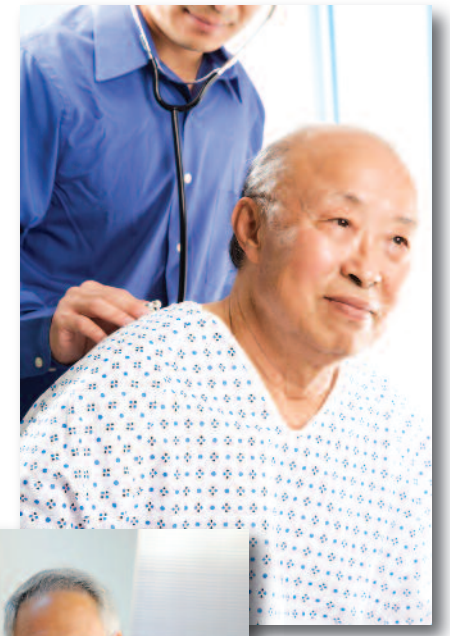
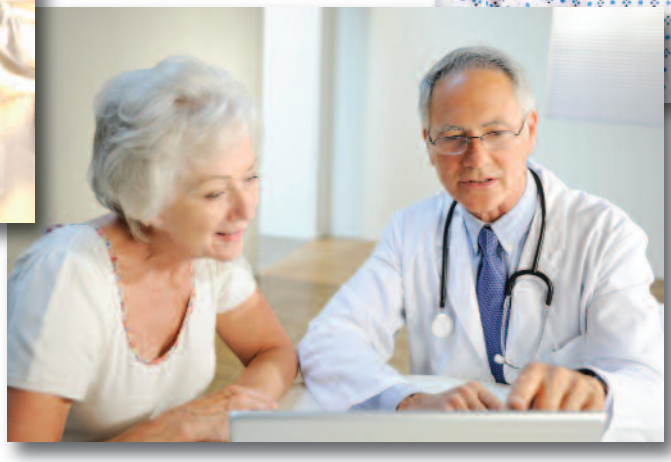
LUNG CANCER ALLIANCE

Detecting lung cancer early can save your life.

What you need to know about CT screening.







Partnership Network: LEGACY FOR LONGER HEALTHIER LIVES

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Preface

In November 2010, National Cancer Institute concluded an eight year trial which proved that screening people at high risk for lung cancer with CT scans can save lives. As the leading national organization dedicated solely to providing support and advocacy for those living with or at risk for the disease, Lung Cancer Alliance (LCA) salutes this effort and is committed to disseminating this and other related information about the risks and benefits of lung cancer screening.

The emerging information about the benefit of CT-based lung cancer screening constitutes a major breakthrough and it is essential to get responsible information to those individuals who may benefit. This information is intended to help guide decisions about screening. Lung Cancer Alliance gratefully acknowledges the assistance of members of its Board of Directors and Medical and Scientific Advisory Board.

Dr. Deborah Morosini, MD, LCA Board Member, Sister of the late Dana Reeve: *"Early and accurate detection of lung cancer empowers patients with more, often preferable treatment options. Our community of people at risk for lung cancer has long expressed the need for clear screening guidelines and this website provides such a resource. The remarkable survival benefits seen with low dose CT screening create an opportunity and an imperative to leverage the public health potential of lung cancer screening—safely, affordably, and rationally. Bravo LCA."*

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What is screening?

What is cancer screening?

When people who have no symptoms are tested to detect a cancer, that process is called “screening.”

Screening is not a single test, but a process of finding the people who have cancer through careful interpretation of the test results, appropriate follow-up tests of abnormal results and re-evaluation on a periodic basis to find newly emerging cancer.

The chance of developing some type of cancer generally increases over the course of an individual’s lifetime. In the United States, lifetime risk for men is 44% and for women 38%. The goal of cancer screening is to detect cancer before it has spread (metastasized) to other sites in the body, because early localized cancer can frequently be cured, often by surgery.

Screening tests and recommendations are different for every cancer. All women are encouraged to have regular Pap smears which can screen for cervical cancer. All women age 50 to 74 are urged to have mammograms every other year, but mammograms for women in their forties is still a subject of debate.

PSA testing is available to screen men for prostate cancer. Although randomized controlled trials to evaluate PSA screening have shown conflicting results (negative in the United States and positive in certain European studies), most men have the blood test annually starting at age 50.

Why is cancer screening important?

Cancer is the leading cause of death in the United States of people under 85. (Heart disease is the first and cancer the second leading causes of death in people over 85.) Cancer is one of the most expensive diseases to treat, especially when detected at late stage. Screening increases the chance of being diagnosed at early stage. An early stage diagnosis significantly improves the chances for cure for lung, breast, colon and prostate cancers. Unfortunately, most lung cancers are detected at an advanced stage and, without screening, only 15% of those diagnosed with lung cancer are alive five years later.

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Breast Cancer

Stage Distribution and 5-year Relative Survival by Stage at Diagnosis for 2001-2007, All Races, Females

Stage of Diagnosis	Stage of Distribution (%)	5-year Relative Survival (%)
Localized (confined to primary site)	60	98.6
Regional (spread to regional lymphnodes)	33	83.8
Distant (cancer has metastasized)	5	23.4
Unknown (unstaged)	2	52.4

Prostate Cancer

Stage Distribution and 5-year Relative Survival by Stage at Diagnosis for 2001-2007, All Races, Males

Stage of Diagnosis	Stage of Distribution (%)	5-year Relative Survival (%)
Localized (confined to primary site)	82	100.0
Regional (spread to regional lymphnodes)	11	100.0
Distant (cancer has metastasized)	4	28.8
Unknown (unstaged)	3	69.9

Colon Cancer

Stage Distribution and 5-year Relative Survival by Stage at Diagnosis for 2001-2007, All Races, Both Sexes

Stage of Diagnosis	Stage of Distribution (%)	5-year Relative Survival (%)
Localized (confined to primary site)	39	90.1
Regional (spread to regional lymphnodes)	37	69.2
Distant (cancer has metastasized)	20	11.7
Unknown (unstaged)	5	33.3

Stage Distribution and 5-year Relative Survival by Stage at Diagnosis for 2001-2007, All Races, Both Sexes

Stage of Diagnosis	Stage of Distribution (%)	5-year Relative Survival (%)
Localized (confined to primary site)	15	52.0
Regional (spread to regional lymphnodes)	22	24.2
Distant (cancer has metastasized)	56	3.6
Unknown (unstaged)	7	8.1

SEER Cancer Statistics Review, 1975-2008, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2008/, based on November 2010 SEER data submission, posted to the SEER web site, 2011.

Outcomes are much less favorable for lung cancer because it has already spread to other parts of the body at the time of diagnosis far more frequently than breast, prostate or colon cancers. With current lung cancer treatment approaches, overall only 15% of those diagnosed with lung cancer will live five years or more. This is because only 15% are being diagnosed at an early localized stage when the cancer can be successfully treated by surgical removal.

However, this may change now that screening individuals at high risk for lung cancer with computed tomography (CT) scans can detect lung cancers at early stage and significantly reduce lung cancer mortality.

Examples of cancer screening

Many health agencies recommend that all adults over the age of 50 should have a colonoscopy to screen for colon cancer at least once every ten years.

All women are encouraged to have regular Pap smears which screens for cervical cancer. All women age 50 to 74 are urged to have mammograms every other year which can screen for breast cancer, but mammograms for women in their forties is still a subject of debate.

PSA testing is available to screen men for prostate cancer. Although randomized controlled trials to evaluate PSA screening have shown conflicting results (negative in the United States and positive in certain European studies), most men have the blood test annually starting at age 50.

No screening test is perfect. Screening will frequently yield abnormalities (a positive screen) that require additional testing and may even go to surgery before cancer is

definitely ruled out. These are called “false positives.” In mammography screening, half of all women will have a false positive over the course of ten years of screening.

Alternatively, a screening test could miss a genuine cancer. One in five cancers may be missed by mammography. These are called “false negatives.”

Participating in a screening process frequently increases anxiety in people undergoing the tests.

The cost and risk involved in screening the large numbers of the adult population at risk for cancers are high but must be weighed against the benefit of catching it early, which saves both time and money.

Research is ongoing to identify genetic factors and biomarkers in the blood, urine, breath or sputum that may indicate the presence of cancer at even earlier stages. These new tools may allow for a more efficient screening process that may reduce costs or side effects of the screening process.

How do you screen for lung cancer?

The results of national and international trials have shown that screening people at high risk with computed tomography (CT) scans can detect a high percentage of lung cancers at early stage. This capability is the key to reducing lung cancer deaths. According to some reports, CT screening can find about 95% of lung cancers, with a false positive rate of about 10-20%.

Currently no other method of screening for lung cancer has been found to be effective.

Research is ongoing to find biomarkers in the blood, urine, breath or sputum that would give an early indication that lung cancer may be present, or to find a genetic clue that a person is predisposed to lung cancer. Accomplishing this is proving to be more elusive and complicated than initially thought and may take decades to realize, as the Director of the National Cancer Institute noted in his recent book. For example, a recent paper indicated that a single lung cancer in a single patient was found to have 50,000 genetic mutations. Yet there is promising research that may enhance routine detection of early, curable lung cancer.

How does a CT scan work?

Unlike a chest x-ray which produces flat, 2-dimensional images of the lungs, a CT scanner can explore the entire volume of the lungs by taking a continuing series of x-rays in a helical spiral around the chest. The images taken by a CT scanner can be examined on a computer in “slices” and reconstructed in 3-dimensions giving far more detailed information about the volume and shape of lung nodules.

The capability of CT scanners to detect the size and shape of lung nodules, and to compare the nodules and measure any change in size and volume in subsequent scans, is key to the process of screening.

How did CT screening come about?

In the 1970's and 1980's, studies looked at chest x-rays as a tool for screening people at high risk for lung cancer, but the results were disappointing. However, at the same time, the field of imaging advanced rapidly with the introduction of computed tomography (CT) scanners which gradually became widely available.

In 1991, radiology researchers led by Claudia Henschke, MD, began investigating the potential of CT scans to provide the screening benefit that chest x-rays failed to show. Initially started in New York State, this ongoing observational study and research program, the International Early Lung Cancer Action Program (I-ELCAP), now has over 50,000 participants in thirteen states and eight other countries. The purpose is twofold: to assess the impact of CT screening on high risk patients and to continuously upgrade and improve the comprehensive I-ELCAP protocol - the standards and precise regimen for screening and diagnosis - as imaging advances and new findings become available. Results published in the *New England Journal of Medicine* in 2006 indicated that CT screening with the I-ELCAP protocol could lead to ten year survival rates of nearly 80% in high risk patients diagnosed with lung cancer.

For more information on I-ELCAP visit: http://www.ielcap.org/

In 2002, the National Cancer Institute launched the National Lung Screening Trial (NLST) and recruited over 53,000 people, current and former smokers between the ages of 55 and 74. Half were screened with chest x-rays and the other half with CT scans. The endpoint or target was to see if CT screening could reduce the number of lung cancer deaths by at least 20%. Each participant received three annual screens starting in 2005 and ending in 2007. Although the NLST was to run through 2012, in November, 2010, the trial was stopped as soon as it became evident that there were 20.3% fewer lung cancer deaths (technically referred to as a mortality benefit) among those who were screened by a CT scan. Those in the chest x-ray group were immediately advised of the significant benefit of CT scans and urged to contact their doctors. The NCI announced the results and held a press conference in November 2010.

To put the 20.3% figure in context, the overall mortality benefit of mammography screening for breast cancer is 15%. PSA testing for prostate cancer failed to show any mortality benefit in US based randomized controlled trials but did show a 20% benefit in a Swedish trial.

The actual mortality benefit of CT screening could be much greater. Recent modeling studies by I-ELCAP and others suggest that it could range from 37-65%.

For more information on NLST visit:
http://www.cancer.gov/clinicaltrials/noteworthy-trials/nlst

What is my risk?

What is my risk of cancer?

Over the course of a lifetime, a man in the United States has a 44% chance and a woman has a 38% chance of being diagnosed with some form of cancer.

An estimated 1,596,670 people in the United States will be **diagnosed** with cancer in 2011. The leading sites of cancers are:

Lung:	**221,130**
Prostate:	**240,890**
Breast:	**230,480**
Colorectal:	**141,210**

Lung cancer will cause more **deaths** than breast, prostate and colon cancers combined. The leading causes of estimated cancer deaths for 2011 are:

Lung:	**156,940**
Breast:	**39,520**
Colorectal:	**49,380**
Prostate:	**32,720**

The total number of people being diagnosed with any cancer is expected to increase by 45% over the next 20 years. Lung cancer will increase overall by 52%, with increases ranging from 75% to 191% among minority populations.

Am I at risk for lung cancer?

Overall, one in fourteen adults will be diagnosed with lung cancer during the course of a lifetime. Smoking is by far the biggest risk factor, causing 80-85% of lung cancer in the

U.S. The degree of risk increases with the number of years the person smoked and the number of packs a day.

An important consideration for screening is whether the level of individual risk is high enough for screening to be of benefit. If you are over 50 and smoked the equivalent of a pack a day for 30 years (or three packs a day for ten years), your risk for lung cancer is high enough to be similar to those individuals in research studies where screening reduced lung cancer mortality.

What is my personal risk of lung cancer?

The lung cancer risk of an individual can be accurately estimated using simple medical history information including age, smoking and occupational history.

David Burns, MD, emeritus professor of medicine at the University of California at San Diego, has developed a helpful risk assessment guide from an analysis of Cancer Prevention Study II data published in Monograph No. 8 by Michael Thun, PhD, *et al* on smoking and premature death. (To view the entire paper go to: http://cancercontrol.cancer.gov/tcrb/monographs/8/m8_5.pdf)

The graph shows the number of cases of lung cancer (per 100,000 people) in each box based upon age and number of cigarettes smoked.

To get an estimate of your personal risk, go to the row that describes the number of cigarettes you have smoked on average each day, then move to the right until you reach the column representing your age group. For example, if you are a man and 55 years old who has smoked an average of two packs/day, then your estimated risk of lung cancer is 335 out of 100,000 or 0.335% risk per year during the next five years and will rise to 0.499% per year in the next five year period. This identifies your risk of lung cancer during the next ten years as between 3-5%.

Male Lung Cancer Incidence Rates
by Age and Amount Smoked (rates per 100,000)

	Age at Incidence (Death-5 years)								
Cig per Day	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
1-9				42	114	258	362	560	725
10-19				101	103	192	360	859	574
20			43	83	200	297	652	854	1372
21-39			25	114	218	442	510	1042	1326
40			57	159	254	507	836	1244	1525
40+		53	141	220	335	499	999	1469	4067
All Smokers	6	19	41	115	206	361	582	909	1118

2/case per 1,000/year 4+/case per 1,000/year CPSII Data

The data shows that the risk of lung cancer is low in people below the age of forty, with the exception of very heavy smokers. At the other end of the spectrum, the risk of lung cancer in heavy smokers over age 70 is 4000 per 100,000 or 4% risk per year.

Male Lung Cancer Death Rates
by Age and Amount Smoked (rates per 100,000)

	Age at Death								
Cig per Day	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
1-9				42	114	258	362	560	725
10-19				101	103	192	360	859	574
20			43	83	200	297	652	854	1372
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40			57	159	254	507	836	1244	1525
40+		53	141	220	335	499	999	1469	4067
All Smokers	6	19	41	115	206	361	582	909	1118

2 deaths per 1,000 per year 4+ deaths per 1,000 per year CPSII Data

Female Lung Cancer Death Rates
by Age and Amount Smoked (rates per 100,000)

	Age at Death								
Cig per Day	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
1-9			14	19	42	50	109	107	122
10-19			9	45	75	121	202	204	229
20			52	57	117	183	344	394	563
21-39			36	95	213	235	433	603	826
40			121	106	191	412	411	431	929
40+		35	84	226		223	439	794	
All Smokers	4	9	42	65	120	177	286	310	400

2 deaths per 1,000 per year 4+ deaths per 1,000 per year CPSII Data

Because the majority of people with lung cancer die of the disease within five years, the comparable estimates for lung cancer deaths by age and amount of cigarettes smoked per day for men and women are shown in the figures below.

What is my risk of lung cancer if I used to smoke?

Over half of lung cancers are being diagnosed in former smokers. The longer you have stopped smoking, the lower your risk of lung cancer relative to someone who continues to smoke. However, a former smoker's risk of lung cancer will never be as low someone

who has never smoked. In general, if individuals have not stopped smoking by ages 45-50 they will remain at a level of risk high enough to benefit from screening for at least 15 years after they quit.

Lung cancer tends to develop slowly and it could be 10 to 20 years before symptoms become obvious. In fact, lung cancer frequently shows no symptoms until it has already spread beyond the original lung.

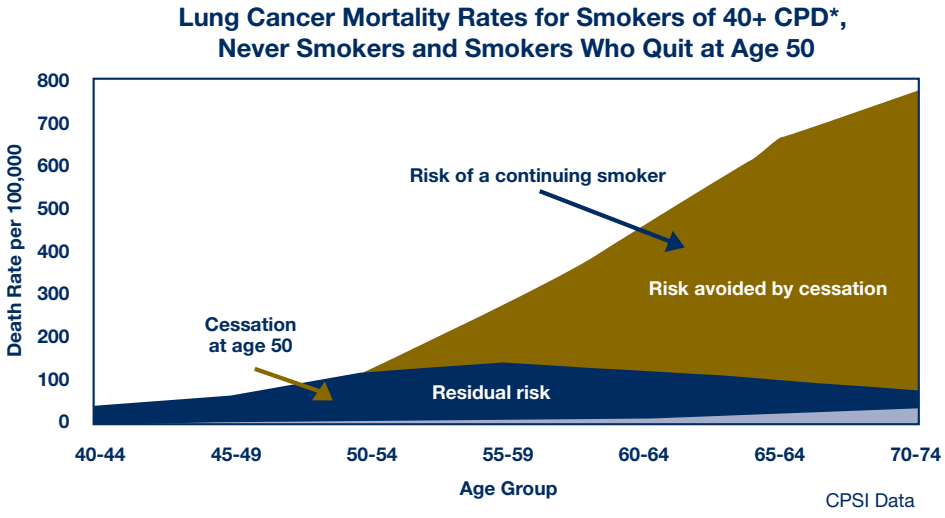
What if I still smoke?

Forty percent of smokers will die prematurely of smoking-caused diseases, on average living fourteen years less than non-smokers. Overall, one out of six men who continue to smoke, and one out of every nine women who continue to smoke, will develop lung cancer in their lifetimes. If not caught early, half will die within the first year after diagnosis.

But, stopping smoking at any age will significantly reduce the risk of lung cancer (as well as heart disease and many other illnesses). For example, a two pack a day smoker who stops at age 50 can reduce his risk for lung cancer from 1 in 10 to about 1 in 50.

Quitting and Risk Reduction

The graphic below illustrates the risk of an individual who smoked two-packs per day and quit at age 50.



*(CPD stands for cigarettes per day)

These corves show that personal estimated current risk of lung cancer is, and what the risk of developing lung cancer in future years will be, depending upon whether one continues to smoke or quits now.

In this example, at age 50 the risk of lung cancer is approximately 100 out of 100,000 or 0.1% per year or 1% during the next 10 years if the individual quits smoking, and will stay at approximately 1% during the next decade for a cumulative risk of 2%.

If, however, he or she continues to smoke the risk rises to greater than 0.4% per year at age 60 and to 0.8% per year at age 70. The bottom line is that the 50 year old smoker in question can reduce personal cumulative risk of lung cancer from 10-12% to 2% by quitting smoking now.

If I never smoked, am I at risk?

Even people who never smoked can get lung cancer. According to the Centers for Disease Control and Prevention (CDC), an estimated 7,000 men and 20,000 women who never smoked or were exposed to second hand smoke died of lung cancer in 2008. Lung cancer in never smokers is the sixth leading cause of cancer deaths, larger than the combined total of deaths from brain cancer, melanoma and thyroid cancers.

You may be at risk if you have a close family member related by blood (mother, father, brother, sister or child, and possibly an aunt or uncle) who died of lung cancer, or if you had significant exposure to second hand smoke or radon. Your occupation or military service may have increased your risk if you had significant exposure to asbestos, Agent Orange, uranium, chromium, arsenic, beryllium, crystalline forms of silica or other cancer causing chemicals and pollutants.

For the President's Cancer Panel Report of 2010 on Environmental Factors and Cancer visit: http://deainfo.nci.nih.gov/advisory/pcp/annualReports/pcp08-09rpt/PCP_Report_08-09_508.pdf

For more information on veterans and lung cancer visit: http://www.lungcanceralliance.org/facing/FocusOnVeterans.html

Not all the risks factors for lung cancer are understood or even known. To date, screening research has focused primarily on smoking and lung cancer, so little is known about how people can estimate their risk from other factors.

Lung cancer is the leading cause of death in all ethnic groups, but the impact of lung cancer incidence and mortality appears to be most pronounced on African American men.

More women than men who never smoked are diagnosed with lung cancer.

For more information on the impact of lung cancer on specific minority populations and women go to: www.lungcanceralliance.org/press/pressroom.html

Who should be screened?

Should everyone be screened for lung cancer?

No. To date, we only know that CT screening for lung cancer can reduce lung cancer deaths in a high risk population of current and former smokers over the age of 50. More needs to be done to identify which smokers and former smokers are at highest risk and which groups other than heavy smokers may benefit from screening.

As more people at obvious high risk are screened, we can learn how to refine the screening process to make it safer, cheaper and less intrusive. Once we know more it may make sense to extend screening to other groups of people with lower risk profiles to improve the rate of early stage detection.

Ongoing research may identify other indicators in blood, sputum, urine or breath that may lead to simpler tests to pre-screen for lung cancer. Several promising approaches are being tested but their effectiveness in large groups of people has not yet been evaluated.

Will screening encourage smokers to continue?

There is no scientific evidence to support this.

Unfortunately, lung cancer carries a stigma of blame because some people see smoking as a lifestyle choice rather than a powerful addiction. Thus, some think that screening smokers would be a waste of money.

On the other hand, screening may help people quit. There is good evidence that most smokers have tried several times to stop without success and that lung cancer screening is a good time to help them be more successful.

Many smokers are fatalistic, believing that the damage may have already been done, so there is no value to quitting. Getting a clear scan can give reassurance that it is not too late and become the moment when information on how to quit would be most meaningful.

Screening may help provide a teachable moment for those who still smoke.

Lung Cancer Alliance believes that every screening program should include a proactive tobacco cessation program to help current smokers quit, such as Legacy's innovative "Become an Ex" smoking cessation program and the National Quitlines.

For more information on smoking cessation, visit:
http://www.becomeanex.org/ or http://www.naquitline.org

What are the risks involved?

Additional testing

The goal of screening is to diagnose a cancer at an early stage when it is most treatable and curable. The step by step procedure for screening and determining whether suspicious findings are cancer or not cancer is called a protocol.

CT scanners can "see" minute lung abnormalities as small as a grain of rice. If the scan picks up any findings suspicious for lung cancer, such as nodules over a certain size, or enlarged lymph nodes near the lung or a lesion in the main airways, it is classified as a positive screen.

That does not mean that the suspicious findings are definitely cancer. Many people, especially smokers or former smokers, will have a positive screen that could be caused by inflammation, scarring or other lung diseases rather than lung cancer.

About 10-30% of people screened for cancer by mammography, colonoscopy, PSA testing, or CT scans will have a positive screen which requires additional testing. Most will be false positives and only a small percentage will prove to be cancer.

On average about 13% of those screened at sites utilizing the I-ELCAP protocol will have suspicious findings - a positive screen - the first time they are scanned which will require additional testing.

Positive screens will usually be followed by a second scan two or three months later to check for any change or increase in volume. Nodules larger than a blueberry found on the first scan and those that appear to be growing on the second scan may be tested further with a positron emission tomography (PET) scan to check for metabolic activity in the nodule that may indicate cancer.

A biopsy may be needed so that a small sample of tissue from the nodule can be examined under a microscope for cancer cells. Tissue is collected through a tube inserted down the windpipe (bronchoscopy) or with a needle through the chest wall (percutaneous fine-needle aspiration). Both procedures entail some risk of bleeding, infection or collapsed lung and should only be done by experienced doctors.

Even with all these precautions, some nodules - about 0. 5% - that are not cancerous may end up being removed by unnecessary surgery. All lung surgery carries significant risk and after effects.

False positive screening tests have the potential to result in further testing, additional radiation exposure, cost and possibly unnecessary biopsies or surgeries which entail additional risks. These potential problems can be safely managed with adherence to a well developed protocol for the screening, diagnosis and treatment of early lung cancer. Pooling the findings of the NLST, I-ELCAP and other international studies can translate the acquired data into a protocol that will provide patients the maximum benefits from screening with the lowest possible risks.

Anxiety

Consider how you might feel if your doctor told you that a nodule had been found on your CT scan and that more tests were required to determine if you had lung cancer. You would quite naturally be worried, anxious and perhaps lose sleep over the report.

Understandably many people who have suspicious findings (a positive screen) will experience anxiety during the evaluation period. But studies have shown that anxiety rapidly disappears when subsequent tests rule out cancer. For those whose cancers are confirmed, their anxiety must be weighed against the benefit of having the tumor diagnosed at a very early stage when treatment can be most successful.

It must be emphasized that CT-based lung cancer screening is not a test, but rather a process. The approximately 15% of individuals who have a solid lung nodule larger than five mm or a non-solid nodule larger than eight mm in diameter have further testing to determine if the individual with a nodule has a cancer (approximately 12%) or a benign nodule (approximately 88%) in the lung. The type of test, the order of tests and the time at which further testing should best be done is outlined in an organized plan called an algorithm or regimen.

The 88% of individuals who receive a negative report will logically be relieved of anxiety that might have been experienced before, during or after the performance of the CT-scan. For this reason it is important to minimize the delay between performance of the scan and the generation of a report.

With respect to anxiety in screening, it should be understood that screened subjects start with a level of anxiety; that the reason for an individual enrolling in a screening program is anxiety about dying of cancer based upon information received in public health information or from a private physician. There is data from multiple studies indicating that research subjects tolerate anxiety experienced before and during cancer screening, as well as anxiety caused by positive screening results, and consider it to be a reasonable trade off for the benefit they derive from screening.

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Radiation

Screening scans that check people who have no symptoms for lung cancer are given at low dose. In fact, screening scans are referred to as low dose CT scans (LDCT). Follow-up scans that may have to be done to determine if any change or growth has occurred should be at the same low dose.

People living in the United States are exposed to naturally occurring radiation on average of 3mSv a year, and as high as 10mSv in areas of higher altitudes. Under the I-ELCAP protocol, the radiation from a CT screening scan has been reduced to about the same as a mammogram - from less than 1 to 1.5 millisieverts (mSv). Similar, but slightly higher low dose scans were used in the NLST trial.

In the past few years, there have been a number of articles in the medical as well as the lay media suggesting that CT scans can cause substantial harm and may cause cancer. Harm can come in the form of improperly done CT scans that inappropriately expose patients to much higher than necessary levels of radiation exposure - another reason why CT screening should only be done at a competent, experienced site that adheres to a well-defined protocol for screening.

The evidence suggests that the risk of cancer caused by lung cancer screening CT scans is very low. Furthermore, it is well understood that radiation risk of future cancer is much higher when children and young adults are exposed to radiation than when older people are. One reason for this is that cancers caused by radiation exposure occur many years after the exposure. Young people are not and will not be screened for lung cancer. Only older adults, who are known to have a markedly lower lifetime risk of subsequent cancer from radiation exposure, would receive screening CT scans in properly conducted lung cancer screening programs.

In addition, there is substantial data from multiple sources that demonstrates no measurable increase in cancer incidence or mortality resulting from diagnostic radiographic studies in adults.

Radiation exposure received by adult women during radiation therapy for breast cancer results in much higher radiation exposure than does radiation exposure from lung cancer screening, by an enormous factor. And yet, even in the case of long-term follow-up following such high-dose radiation therapy treatment for breast cancer, in tens of thousands of non-smoking adult women, there is no indication of any statistically increased incidence of lung cancer on the side of radiation therapy compared to the contra lateral un-radiated lung.

CT scans are not new. Diagnostic CT scans were first performed in the U.S. at the Mayo Clinic in Rochester, MN, in the early 1970s, and there has been a steadily increasing use of the technology during the subsequent 40 years. At present, the number of CT scans performed exceeds 70,000,000 each year.

CT scans make up only a percentage of total radiation exposure from diagnostic procedures such as x-rays and angiograms. Yet, when looking for an increase in total cancers in the US that might have been caused by these diagnostic tests, one finds that there is no identifiable increase in the incidence of cancer in the US, despite the marked increase in the number of CT and angiographic studies performed over the past 40 years. Rather, the overall incidence of cancer in the US is decreasing, as is the number of cancer deaths.

Furthermore, if one looks at annual incidence in the US of cancers known to occur in children exposed to high-dose radiation therapy, such as leukemia and soft tissue sarcoma, again, one finds no evidence of increased numbers of these cancers.

The bottom line is that, despite speculation to the contrary, if there is any increased risk of cancer caused by low-dose CT scans in middle-aged and elderly individuals at high risk of lung cancer because of previous or current smoking, it is not measurable, and must be very small. There would accordingly be a highly favorable risk to benefit ratio in the chance of the individual suffering and dying of lung cancer as a result of lung cancer screening.

Finally, even if a hypothetical cancer occurred within the field of a previous chest CT scan, one might reasonably expect that such a radiation-induced cancer would be diagnosed by subsequent computerized tomogram studies at an early, curable stage.

What if the nodule is cancerous?

Because most lung cancers found by screening are small in size and early stage, treatment is most often surgery. However, surgery involves differing levels of risk (from 0.1% to 5%) depending on the type of surgery (removal of a wedge section, a lobe or an entire lung) and the experience of the surgeon. Consequently, surgery should only be done by accredited thoracic surgeons with experience in lung cancers.

When lung cancer is diagnosed without screening, after symptoms develop, it is in an advanced stage in which treatment of chemotherapy, radiation therapy or combination chemotherapy and radiation therapy is given. Surgery is typically done in selected cases following chemotherapy and/or radiation therapy. Such surgery typically requires thoracotomy and in many cases surgical removal of an entire lung or removal of ribs. Such surgery can result in death or major complications, pain and disability. Recurrence of cancer and death is very common despite these treatments.

Because most lung cancers found by CT screening are of small size and early stage, treatment is most often with surgical resection only, without the need to add radiation therapy or chemotherapy after surgery. In many circumstances, surgical resection of small, early-stage lung cancers can be performed without thoracotomy, using video-assisted (VATS) or robotic minimally invasive techniques that appear to have equivalent survival with smaller surgical incisions and more rapid recovery. Removal of an entire lung is rarely necessary.

Research is ongoing to determine whether resection of smaller amounts of lung tissue (wedge resection or segmentectomy) will provide similar survival results.

In elderly patients or patients with major heart and lung disease that make surgery risky, cure can be attained without surgery using modern radiation therapy methods or local destruction of cancer with radiofrequency ablation or other physical methods. These methods have not yet been shown to produce cure rates from surgical resection.

Emerging data suggests that screen-detected lung cancers can be routinely managed with less invasive video-assisted surgery (VATS) which can reduce the side effects, length of hospital stay and cost, and also significantly reduce the risk of mortality from the surgery. Some studies indicate that VATS can reduce the risk of surgical mortality to 0.1%.

For more information on VATS surgery and additional information on treatment visit: www.lungcanceralliance.org

What is the biggest risk?

The biggest risk is not having it done properly.

You must talk to your primary care doctor about the risks and benefits as they relate to your particular health history and only go to CT screening sites that meet the criteria found under “Where do I go?”

An important consideration will be the protocol used by the site. The only protocol that is being continuously refined to incorporate the results of ongoing research and imaging advances as they occur is the International Early Lung Cancer Action Program protocol, which covers the entire step by step procedure from the calibration of the scanner to pathology.

(To read the I-ELCAP protocol, visit: ttp://www.ielcap.org/professionals/docs/ielcap.pdf)

How do I decide? Where do I go?

How do I decide?

The decision on whether to be screened or not should be made with the help of your primary care doctor. Your doctor knows your history and possible risk factors best. You will need a prescription from your doctor to get a screening scan. And, your doctor can help guide you to the right site and ask questions of the site in advance on your behalf.

Where do I go?

Only go to an experienced site:

- That follows an organized plan — a proven regimen or protocol — that is updated to incorporate new technology and knowledge, such as the one developed by International Early Lung Cancer Action Program (I-ELCAP), for subsequent diagnostic testing when a nodule is found on the screening scan;
- That has a commitment to a high-quality screening program with adequate staff and resources;
- That will have the scans read by an American Board of Radiology board certified radiologist with special training and expertise in lung cancer screening;
- That is accredited in CT by a certifying organization, such as the American College of Radiology;

- That has modern multi-slice CT scanning equipment managed to provide high-quality, low-dose, and non-contrast spiral CT scans;
- That is part of or affiliated with a health care facility which has expertise and excellence in radiographic and/or endoscopic biopsy techniques and which has board certified pulmonary medicine and thoracic surgical practitioners with special interest and expertise in the diagnosis and treatment of lung cancers diagnosed in screening programs.

You will need a prescription from your primary care doctor who can also help guide you to the right site and ask questions of the site in advance on your behalf.

Experienced Sites

Experienced sites would include:

- All National Cancer Institute Cancer Center sites:
  http://cancercenters.cancer.gov/cancer_centers/
  cancer-centers-list.html
- All sites that participated in the National Lung Screening Trial NLST:
  http://www.cancer.gov/clinicaltrials/noteworthy-trials/
  nlst/screeningcenters/screeningcenters
  — Please note the new phone number for the Georgetown University Lombardi Comprehensive Cancer Center, 202-342-2400
- All International Early Lung Cancer Action program (I-ELCAP) sites: http://www.ielcap.org/members/memberlist.php
- Certain VA sites:
  THE PHOENIX VA LEGACY-ELCAP STUDY
  Phoenix VA Health Care System
  650 E. Indian School Road (RS/151)
  Phoenix, AZ 85012-1892
  http://www.phoenix.va.gov/

This list will be updated on a regular basis as information on additional sites following best practices is made available to us.

LUNG CANCER ALLIANCE

Is CT screening covered by insurance?

CT scans to **diagnose** lung cancer in a person **with symptoms** are covered by Medicare ($300 on average) and most insurance companies. But CT scans to **screen** a person **without symptoms** for lung cancer are not yet covered by Medicare or most insurance companies.

This may change when the U.S. Preventive Services Task Force (USPSTF) revises its recommendations on CT screening for lung cancer. The current recommendation is neutral - an "I" rating -which stands for "insufficient evidence to recommend for or against." (PSA testing for prostate cancer carries the same "I" recommendation.)

Medicare and insurance companies generally follow USPSTF recommendations in making coverage decisions. The new healthcare law will make coverage mandatory only for procedures with an "A" or a "B" USPSTF recommendation.

Immediately after the results of the NLST were released, Lung Cancer Alliance asked the USPSTF for an immediate review of the new findings. In response, the USPSTF said a revised recommendation would not be available for public comment until early 2012. LCA and others are continuing to press for expedited action.

	Cost per Life-year saved Original Report	Year of Cost for Original Report	Cost per Life-year Saves Projected to 2012 Dollars	
			Using CPI-Med	Using CPI-Med x 2
Pap Smear	$ 33,000	2000	$ 50,162	$ 75,181
Colonoscopy	$ 11,900	1999	$ 18,705	$ 28,958
Mammogram	$ 18,800	1997	$ 31,309	$ 51,274
LDCT for Lung Cancer			**2012 Dollars**	
	$ 17,202	2012	$ 17,202	

Is CT screening cost effective?

The cost of treating late stage lung cancer is twice that of finding and curing early stage lung cancer and almost inevitably futile. The cost and risk involved in screening a large block of people at high risk for lung cancer are high but must be weighed against the high treatment costs and the value of lives lost to late stage cancers.

A previous actuarial analysis by Milliman of 350,000 lung cancer mortality records completed in 2009 demonstrated that early diagnosis would save 70,000 lives a year, and that those treated promptly would not only be cured but would be eligible for life insurance.

For information on the Milliman study, visit www.lungcanceralliance.org.

What will happen now with lung cancer screening?

We are in the midst of a healthcare cost and quality crisis. Lung cancer screening is a major new approach that could save many lives but present challenges to our current healthcare system. Additional research could allow a better understanding of how to most optimally deliver safe and effective lung cancer screening in routine care settings. This requires definition of who is best equipped to provide the care as well as what the best process is to deliver the service. Progress with these issues may reduce cost and ensure that high quality screening services can be provided to all at-risk individuals across our country.

LUNG CANCER ALLIANCE

About LCA

Based in Washington D.C., Lung Cancer Alliance is the only national non-profit organization dedicated exclusively to providing support and advocacy for those living with or at risk for lung cancer. Now in its 16th year, the Alliance is committed to reversing decades of stigma and neglect by empowering patients, elevating awareness and changing health policy.

The Alliance holds Charity Navigator's highest 4-star rating.

For more information, please visit www.lungcanceralliance.org.