

SELECTIVE SCREENING OF LUNG CANCER CASES

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Lung cancer is the number one cancer killer of American men and women.¹ Lung cancer is the uncontrolled growth of abnormal cells in lung tissue.² Twenty-eight percent of all cancer deaths in the United States are from lung cancer.³ It was estimated that in the year 2000, 164,000 new cases of lung cancer would be diagnosed in the United States.⁴ While lung cancer rates are decreasing among men, they have increased among women.⁵ Recent statistics indicate that there has been a progressive slowing of the lung cancer death rate among women in recent years, although lung cancer still surpasses the number two killer of women, breast cancer.⁶

Despite the large incidence and mortality associated with lung cancer there are few available options to patients for early diagnosis and treatment. Lung cancer is difficult to detect. The majority of people diagnosed with lung cancer have a history of smoking. Sadly, most people diagnosed with lung cancer will die from the disease.⁷

The attorney handling a medical malpractice case involving lung cancer misdiagnosis must carefully screen his/her case and have strong facts to support

¹ Lynn Ries, et al., *The Annual Report to the Nation on the Status of Cancer, 1973-1997, With a Special Section on Colorectal Cancer*, 88 (10) *CANCER*, 2399-2424, 2404 (2000). See also, *SEER Cancer Statistics Review 1990-1997* (visited January 3, 2001) at

<<http://seer.cancer.gov/Publications/ReportCard/html>>. [The Surveillance, Epidemiology and End Results (SEER) reports are considered the most authoritative source on cancer statistics for incidents and survival in the United States.]

²A dictionary of common terms for lung cancer from the National Cancer Institute is included at the end of this paper which is taken from *Lung Cancer* (posted August 1, 1999, visited January 5, 2001) http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm.

³ Paul Frame, *Routine Screening for Lung Cancer? - Maybe Someday, But Not Yet*, 284 (15) *JAMA*, 1980, 1980 (2000).

⁴ www.lungusa.org/diseases/lungcanc.html. (visited January 3, 2001).

⁵ Lynn Ries, et al., *The Annual Report to the Nation on the Status of Cancer, 1973-1997*, *supra* note 1, at 2407.

⁶ Lynn Ries, et al., *The Annual Report to the Nation on the Status of Cancer, 1973-1997*, *supra* note 1, at 2407. See also, *SEER Cancer Statistics Review 1990-1997 - Table for Top 15 Female Cancer Mortality Sites*, *SEER Cancer Statistics Review 1990-1997 Supplemental Materials #1: Rates and Trends for the Top 15 Cancer Sites By Sex and Race/Ethnicity for 1990-1997* (visited January 3, 2001) at <<http://seer.cancer.gov/Publications/ReportCard/html>>.

⁷ Patz E., et al, *Screening for Lung Cancer*, 343(22) *THE NEW ENGLAND JOURNAL OF MEDICINE*, 1627, 1627 (2000).

the time and expense involved in handling the case from intake through trial and/or appeal.

I. DIAGNOSIS AND SCREENING FOR LUNG CANCER

A. Screening for Lung Cancer

Detection of lung cancer at its earliest (and most treatable) stages is difficult. Symptoms of lung cancer do not usually occur until the patient has advanced staging and incurable cancer.⁸ For this reason, handling a misdiagnosis of lung cancer case is difficult from the outset for the plaintiff's medical malpractice attorney.

At this time there is no recognized protocol for lung cancer screening in asymptomatic patients. (Compare this to the current screening done for cervical, prostate, breast and colon/rectal cancer routinely performed in the United States when patients are asymptomatic.) In fact, there is no major medical association in the United States that sets out any standards for routine screening of lung cancer.⁹ Although standard radiographic chest films and cytology testing of sputum have been utilized by some medical providers for early detection of lung cancer, they have been unsuccessful in reducing the overall mortality of lung cancer, even if the lung cancer is caught at an early stage.¹⁰

Screening lung cancer with plain chest films depends on the size of the lesion, position of the lesion in the lung, and its morphology.¹¹ Larger lesions are easier to detect than smaller lesions, and peripheral lesions are more readily detected than central lesions.¹² Missed lung cancer diagnosis using chest films is not uncommon. In one study of 27 missed lung cancer diagnoses, the most frequently identified cause of the missed diagnoses was the failure of the radiologist to compare former chest films with the current chest film.¹³ Other important factors included the location of the lesion in the upper lobe (81%) and female gender of the patient (67%).¹⁴ It should be noted that a lesion found on chest films that is stable for 2 years is benign.¹⁵ Because of the difference in opinion in the medical community as to the size and methodology of prior studies involving radiology screening, many physicians believe that additional research needs to be conducted. A large randomized trial is currently underway by the National Cancer Institute to help determine the value of chest x-ray screening for lung cancer.¹⁶

⁸ Thomas Petty, *Screening Strategies for Early Detection of Lung Cancer- The Time is Now*, 284 (15) JAMA, 1977, 1977 (2000).

⁹ Petty, *supra* at 1977. Frame, *supra* note 3, at 1981.

¹⁰ Frame, *supra* note 3, at 1981. See also *Screening for Lung Cancer* (last modified January, 2001) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

¹¹ Leslie Quint, et al, LUNG CANCER-PRINCIPLES AND PRACTICE (Harvey Pass, et al. eds., 2d ed. Lippincott, Williams & Wilkins) at 535 (2000).

¹² Leslie Quint, et al, LUNG CANCER-PRINCIPLES AND PRACTICE, *supra* at 536.

¹³ Austin M., Romney B, Goldsmith L., *Missed Bronchogenic Carcinoma: Radiographic Findings in 27 Patients with a Potentially Resectable Lesion Evident in Retrospect*, 182 Radiology 115 (1992).

¹⁴ Id.

¹⁵ Leslie Quint, et al, LUNG CANCER-PRINCIPLES AND PRACTICE, *supra* note 11, at 537.

¹⁶ Gohagan J, Prorok P, Kramer B, et al.: *The Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial of the National Cancer Institute*. 75(suppl 7) CANCER 1869-1873, (1995). 37,000 men and 37,000

With the advances in radiology, it has been found that computed tomography (CT) is better than standard chest x-rays for staging a known or suspected lung cancer.¹⁷ CT scans of the lung allow for three-dimensional images of the lung. Current use of low radiation, high-resolution computed tomography (CT) has been found to find nodules as small as 3.0 mm and that these small lung cancers could be surgically resected.¹⁸ Helical computed tomography (spiral CT) may ultimately prove to be more effective than chest x-rays in identifying early lung lesions and additional clinical trials are currently being done with this diagnostic modality.¹⁹

Recent medical literature is mixed on the effectiveness of current diagnostic screening mechanisms available. Overall, the medical literature indicates that early detection does not make a significant change in mortality. However, some researchers believe that there may be some hope for the future that early detection may help increase survival rates from lung cancer. It has been urged in one recent medical journal²⁰ that tens of thousands of lives could be saved if patients with early stages of lung cancer are properly diagnosed and treated. Sputum cytologic testing and bronchoscopy with light-intensified fluorescent endoscopy more accurately find lung cancer.²¹ Since 1987, the Japanese have had a nationwide lung cancer-screening program that primarily utilizes cytologic sputum screening.²² Sputum cytology is a simple test useful in detecting lung cancer where cells are microscopically examined from a deep-cough sample of mucus in the lungs.²³ The results of the Japanese screening program have shown that centrally located early stage lung cancer which does not show extrabronchial invasion can be detected and can be favorably treated with surgery and follow-up cytologic sputum screening for additional centrally-located lung cancer.²⁴ Future cytologic sputum screening may look for molecular markers from expectorated sputum that may be more sensitive and specific in detecting lung cancer.²⁵ However, current medical practice does not require the practitioner to utilize these diagnostic techniques. There are ongoing clinical trials and research to determine what screening techniques and tests are effective in improving the survival and mortality rate of lung cancer. Improved diagnostic testing may someday allow a lung cancer patient to be screened early and obtain a more favorable chance of survival and cure.

women are receiving annual postero-anterior (PA) view chest x-rays for lung cancer screening in this current study.

¹⁷ Quint, et al, LUNG CANCER-PRINCIPLES AND PRACTICE, *supra* note 11, at 535.

¹⁸ Henschke C, et al., *Early Lung Cancer Action Project: Overall Design and Findings From Baseline Screenings*, 354 LANCET 99-105 (1999). *See also*, Sone S., et al. *Mass Screening for Lung Cancer with Mobile Spiral Computed Tomography Scanner*, 351 LANCET 1242-1245 (1998).

¹⁹ Henschke C, et al, *supra* note 18, at 99-105.

²⁰ Petty, *supra* note 8, at 1977.

²¹ Petty, *supra* note 8, at 1978.

²² Koike T., Terashima M., Tsuneo T., et al, *Surgical Results for Centrally-Located Early Stage Lung Cancer*, (4) ANN. THORACIC SURGERY 1176-1180 (2000).

²³ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

²⁴ Koike T., Terashima M., Tsuneo T., et al, *supra* note 22, 1176-1180.

²⁵ Petty, *supra* note 8, at 1978.

B. Symptoms of Lung Cancer

It is not uncommon for a patient in the early stages of lung cancer to be without symptoms. Many patients may not see a physician with symptoms of lung cancer until the cancer is in its advanced stages. In fact, in its early stages, lung cancer is asymptomatic.²⁶ The lack of symptoms is particularly true in patients with peripheral lesions.²⁷ Less than 5% of lung cancer patients have their lung cancer discovered when they are asymptomatic.²⁸

When a patient does exhibit symptoms they may have any of the following common symptoms of lung cancer:

1. Shortness of breath
2. Chronic Cough (which is the most common symptom)
3. Hoarseness
4. Coughing up blood or rusty colored sputum
5. Weight loss and loss of appetite
6. Fever without a known reason
7. Wheezing
8. Recurrent infections, such as bronchitis & pneumonia
9. Chest pain
10. Fatigue
11. Swelling of the neck and face²⁹

II. PROGNOSIS AND TREATMENT OF LUNG CANCER

Even with the best of current diagnostic and treatment modalities, the five-year survival rate for lung cancer remains at 14 percent.³⁰ Treatment is limited in its effectiveness.

The type of lung cancer and the staging of the lung cancer are the biggest determiners of 5-year survival and cure. There are two main types of lung cancer: small cell and non-small cell.

Quick comparison of the 2 most common types of lung cancer³¹:

²⁶ Michael Kraut & Antoinette Wozniak, LUNG CANCER-PRINCIPLES AND PRACTICE (Harvey Pass, et al. eds., 2d ed. Lippincott, Williams & Wilkins) at 521 (2000).

²⁷ *Id.*

²⁸ Chute C, Greenberg E, Baron J, et al. *Presenting conditions of 1539 population-based lung cancer patients by cell type and stage in New Hampshire and Vermont*, 156 CANCER 2107 (1985).

²⁹ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

<http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm>, Michael Kraut, et al, LUNG CANCER-PRINCIPLES AND PRACTICE, *supra* note 25, at 521.

³⁰ Patz E., et al, *supra* note 7, at 1627.

Non-Small Cell Lung Cancer

- * More common
- * 3 Main Types: squamous cell carcinoma, adenocarcinoma, large cell carcinoma
- * Grows more slowly
- * Spreads more slowly to distant organs
- * Staging done with TNM staging system of AJCC

Small Cell Lung Cancer

- * Less Common
- * Oat cell Cancer
- * Grows more rapidly
- * Spreads faster to Distant Organs
- * Staging done using Veteran's Administration Lung Cancer Study Group's 2 staging system

More detailed important characteristics and information for small cell and non-small cell carcinoma are outlined below:

A. Small Cell Carcinoma:

1. **Staging**

- a) The TNM staging system of the American Joint Committee on Cancer (AJCC) is not commonly used in staging small cell carcinoma due to the common presence of occult or overt metastatic disease.³²
- b) The most common staging used is the Veteran's Administration Lung Cancer Study Group's 2 stage system.³³ Patients with distant metastases are always considered to have advanced stage disease.³⁴

2. **Treatment**

- c) It is more responsive to chemotherapy and radiation than non-small cell carcinoma.³⁵
- d) Localized forms of treatment (surgical resection and/or radiation) rarely produce long-term effects.³⁶
- e) Distant metastasis is common.³⁷
- f) Chest radiation and combination chemotherapy (with more than one chemotherapy drug) are the current forms of common treatment for limited stage of the disease. In extensive small cell carcinoma,

³¹ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm.

³² *Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000)

<http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

³³ *Id.*

³⁴ Zelen M: *Keynote Address on biostatistics and Data Retrieval*, 4(2) CANCER CHEMOTHERAPY REPORTS 31-42, (1973). Mountain, C: *Revisions in the International System for Staging Lung Cancer*. 111 (6) CHEST 1710-1717, (1997).

³⁵ *Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000)

<http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

³⁶ *Id.*

³⁷ *Id.*

combination chemotherapy is the usual method of treatment with radiation usually only given as a palliative measure.³⁸

3. Survival

- g) Median survival is 2-4 months.³⁹
- h) There is a 5-10% survival at 5 years.⁴⁰
- i) In limited stage disease the median survival is 16-24 months with current forms of treatment. Approximately 40% of patients are at the limited stage at the time of their diagnosis with small cell cancer. To be in limited stage the patient's cancer must be confined to the hemithorax of origin, supraclavicular lymph nodes, and/or the mediastinum.⁴¹
- j) The majority of patients die despite state of the art treatment.⁴²
- k) Patients with small cell carcinoma that don't respond to chemotherapy have a median survival of only 2 to 3 months.⁴³

B. Non-Small Cell Carcinoma:

Staging is critical. If the cancer is too far advanced there is very little likelihood of long term survivability. What your experts and treating health care providers say about the staging can make your case; especially regarding your client's "lost chance."

1. Staging of the cancer by an experienced lung cancer pathologist is critical since some cases of small cell lung cancer (which responds well to chemotherapy) can be confused with non-small cell cancer on microscopic examination.⁴⁴ Staging is done by clinical findings (based upon physical examination, radiologic findings, and laboratory studies) as well as pathologic (bronchoscopy, biopsy of lymph nodes, mediastinoscopy or anterior mediastinotomy).⁴⁵
2. In summary, non-small cell cancer patients with Stages I & II have the best prognosis and usually their tumors are surgically resected.⁴⁶ Patients with T3 & T4, as well as regional N2-N3, usually are treated with chemotherapy in combination with radiation. Surgical resection is not commonly performed.⁴⁷

³⁸ *Id.*

³⁹ *Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁴⁵ *Id.* Ginsberg R, *Invasive and Noninvasive Techniques of Staging in Potentially Operable Lung Cancer*. 6 (5) SEMINARS IN SURGICAL ONCOLOGY, 244-247, 1990.

⁴⁶ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁴⁷ *Id.*

In non-small cell cancer anything other than localized cancers have poor results with standard treatment.⁴⁸ Surgery is the major curative therapeutic option and radiation may produce cure in a small number of patients.⁴⁹ In advanced stage disease, overall survival with chemotherapy is poor although modest improvements in median survival have been seen.⁵⁰ Patients with distant metastasis (M1) have a very poor prognosis and usually only palliative radiation or chemotherapy is performed.⁵¹

3. Cellular classification of nonsmall cell carcinoma:⁵²
 - * squamous cell (epidermoid) carcinoma
 - spindle cell variant
 - * adenocarcinoma
 - papillary
 - bronchoalveolar
 - acinar
 - solid tumor with mucin
 - * large cell carcinoma
 - clear cell
 - giant cell
 - * adenosquamous carcinoma
 - * undifferentiated carcinoma
4. The TNM staging system of the American Joint Committee on Cancer (AJCC) was adopted in 1997 and is commonly used in staging non-small cell carcinoma.⁵³

A. TNM Definitions:

For the Primary Tumor (T):

TX	Primary tumor cannot be assessed, or tumor proven by presence of malignant cells in sputum or bronchial washings but not visualized by imaging or bronchoscopy.
T0	No evidence of primary tumor
Tis	Carcinoma <i>in situ</i>

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁵³ AJCC CANCER STAGING MANUAL (American Joint Committee on Cancer – Philadelphia, Pa.: Lippincott-Raven Publishers, 5th ed., at 130-136 (1997).

- T1 A tumor 3 cm or less in greatest dimension, surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus* (i.e. not the main bronchus)
- T2 A tumor with any of the following features of size or extent:
 More than 3 cm in greatest dimension
 Involves the main bronchus, 2 cm or more distal to the carina
 Invades the visceral pleura
 Associated with atelectasis or obstructive pneumonitis that extends to the hilar region but does not involve the entire lung
- T3 A tumor of any size that directly invades any of the following: chest wall (including superior sulcus tumors), diaphragm, mediastinal pleura, parietal pericardium; or tumor in the main bronchus less than 2 cm distal to the carina but without involvement of the carina; or associated atelectasis or obstructive pneumonitis of the entire lung
- T4 A tumor of any size that invades any of the following: mediastinum, heart, great vessels, trachea, esophagus, vertebral body, carina; or separate tumor nodules in the same lobe; or tumor with a malignant pleural effusion**

* The uncommon superficial tumor of any size with its invasive component limited to the bronchial wall, which may extend proximal to the main bronchus is also classified T1.

**Most pleural effusions associated with lung cancer are due to tumor. However, there are a few patients in whom multiple cytopathologic examinations of pleural fluid are negative for tumor. In these cases, fluid is nonbloody and is not an exudate. When these elements and clinical judgment dictate that the effusion is not related to the tumor, the effusion should be excluded as a staging element and the patient should be staged T1, T2, or T3.

Regional Lymph Nodes (N)

- NX Regional lymph nodes cannot be assessed
- N0 No regional lymph node metastasis
- N1 Metastasis to ipsilateral peribronchial and/or ipsilateral hilar lymph nodes and intrapulmonary nodes involved by direct extension of the primary tumor
- N2 Metastasis to ipsilateral mediastinal and/or subcarinal lymph nodes

N3 Metastasis to contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene or supraclavicular lymph node(s)

Distant Metastasis(M):

MX Distant metastasis cannot be assessed

M0 No distant metastasis

M1 Distant metastasis present (includes synchronous separate nodule(s) in a different lobe)⁵⁴

Specify sites according to the following notations:

BRA = brain

EYE = eye

HEP = hepatic

LYM = lymph nodes

MAR = bone marrow

OSS = osseous

OTH = other

OVR = ovary

PER = peritoneal

PLE = pleura

PUL = pulmonary

SKI = skin

B. AJCC Stage Groups:

Occult carcinoma: TX, N0, M0

- * This cancer is generally at an early stage and curable by surgery.
- * Treatment is established after determination of the patient's tumor staging.

Stage 0: Tis, N0, M0

- * This cancer is generally at an early stage and curable by surgical resection.
- * They are at high risk for second lung cancers, many of which are not resectable.
- * Endoscopic photodynamic therapy is starting to be used in investigations as an alternative to surgical resection.

Stage IA: T1, N0, M0

- * No lymph node metastasis
- * Surgery is treatment of choice.
- * Radiation is often done, especially in patients who cannot undergo or refuse surgery.
- * Many patients develop regional or distant metastasis.
- * Chemotherapy or radiation is often given following resection.
- * Endoscopic photodynamic therapy is starting to be used in investigations in highly selected patients.⁵⁵

⁵⁴ AJCC CANCER STAGING MANUAL (American Joint Committee on Cancer – Philadelphia, Pa.: Lippincott-Raven Publishers, 5th ed., at 130-136 (1997). *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁵⁵ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>. Quint, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 11, at 538.

Stage IB: T2, N0, M0

- * No lymph node metastasis
- * Surgery is treatment of choice.
- * Radiation is often done, especially in patients who cannot undergo or refuse surgery.
- * Many patients develop regional or distant metastasis.
- * Chemotherapy or radiation is often given following resection.⁵⁶

Stage IIA: T1, N1, M0

- * Stage II tumors either have no lymph node metastases or spread is limited to hilar lymph nodes.
- * Surgery is treatment of choice.
- * Radiation is often done, especially in patients who cannot undergo or refuse surgery.
- * Many patients develop regional or distant metastasis.
- * Chemotherapy or radiation is often given following resection.⁵⁷

**Stage IIB: T2, N1, M0
T3, N0, M0**

- * Stage II tumors either have no lymph node metastases or spread is limited to hilar lymph nodes.
- * Surgery is treatment of choice.
- * Radiation is often done, especially in patients who cannot undergo or refuse surgery.
- * Many patients develop regional or distant metastasis.
- * Chemotherapy or radiation is often given following resection.⁵⁸

**Stage IIIA: T1, N2, M0
T2, N2, M0
T3, N1, M0
T3, N2, M0**

- * Includes tumors with spread to ipsilateral mediastinal or subcarinal nodes.
- * Patients with IIIA N2 have a poor long-term prognosis and the 5 year survival rate is only 10-15% overall.⁵⁹
- * Depending on clinical circumstances, the principal forms of treatment are chemotherapy, radiation, surgery and combinations of these modalities.⁶⁰

⁵⁶ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>. Quint, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 11, at 538.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁶⁰ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>. Quint, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 11, at 538.

* Superior Sulcus tumors (T3, N0 or N1, M0) usually have a reduced risk for distant metastases. Therefore, radiation alone, surgery alone, or radiation in combination with surgery may be done and some studies have shown a 5-year survival rate of 20% or more.⁶¹

* Chest wall tumor (T3, N0 or N1, M0) patients with bulky primary tumors invading the chest wall may obtain long term survival with complete surgical resection of their tumor. Radiation (given alone or in combination with surgery) and chemotherapy (combined with other modalities) are also used in treatment.⁶²

**Stage IIIB: Any T, N3, M0
T4, Any N, M0**

* Includes tumors with involvement of contralateral mediastinal or hilar nodes, and ipsilateral or contralateral scalene or supraclavicular nodes.

* These patients do not benefit from surgery alone.

* These patients' cancer is best managed by chemotherapy alone, radiation alone or a combination of both.

* Long term survival is poor.⁶³

Stage IV: Any T, Any N, M1 (Tumors with distant metastasis)

* No specific regimen is regarded as standard therapy. Chemotherapy and radiation may be given in order to provide palliative measures.⁶⁴

* Long term prognosis is poor.

B. Metastasis

Lung cancer most commonly metastasizes to the brain.⁶⁵ Approximately 50% of small cell lung cancer patients have brain metastasis.⁶⁶ Other common areas of metastasis are to the bones, liver and adrenal glands.⁶⁷ Metastasis to these areas usually cannot be successfully treated.⁶⁸ Other less common areas of lung cancer metastasis include: the skin; soft tissue; thyroid; ovary; bowel; and pancreas.⁶⁹

⁶¹ Komaki R, Mountain C, Holbert J, et al.: *Superior Sulcus Tumors: Treatment Selection and Results for 85 Patients Without Metastasis (M0) at Presentation*, 19(1) INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY, BIOLOGY, PHYSICS, 31-36, (1990).

⁶² *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>. Quint, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 10, at 538.

⁶³ *Non-Small Cell Lung Cancer-PDQ-Treatment-Health Professionals* (last modified November, 2000) <http://www.cancernet.nci.nih.gov/cgi-bin/html>>.

⁶⁴ *Id.*

⁶⁵ Michael Kraut et al., LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 26, at 526.

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *Id.*

III. PLAINTIFF'S FACTS FOR POTENTIAL MERITORIOUS CASES INVOLVING THE MISDIAGNOSIS OF LUNG CANCER

As discussed above, there is no standard for lung cancer screening in the United States. Therefore, the diagnosis of lung cancer is usually made when (1) the patient has symptoms or (2) by chance when other radiologic/pathology tests are being conducted for other health reasons and a lung lesion/lung cancer is detected.

In a client with known risk factors for lung cancer (especially a patient that has been a long-term smoker) the health care provider should be on the alert for possible development of lung cancer. Complaints by the patient of lung cancer symptoms should be taken seriously and followed-up on by the physician. This is especially true in individuals with long smoking histories.

Below are some representative fact patterns where there may be liability on the health care provider for misdiagnosis of lung cancer. These fact patterns are meant to be representative examples of potential areas of malpractice and are not meant to be exhaustive or complete. You should also be aware that there may be liability on a health care provider when the patient does not have lung cancer but is mistakenly diagnosed as having lung cancer and undergoes expensive, debilitating and emotionally draining treatment for lung cancer. Each medical malpractice case has unique facts and your prospective lung cancer misdiagnosis case should be carefully reviewed with your expert(s) prior to determining where your client's case has merit.

A. Abnormal test results and no follow-up are done.

Some patients may have routine diagnostic testing (usually via radiological chest films or CT scans) performed for other health conditions. Testing may show a lung nodule that needs further investigation. The health care provider (usually a physician) should inform the patient of the abnormal test findings and order additional testing to rule out cancer and determine the cause of the abnormal finding. If the physician fails to order/refer the patient for testing or fails to advise the patient of the abnormal finding so that the patient may seek the testing via another physician, the physician may be liable. (It goes without saying, that a patient who fails to undergo recommended lung cancer screening may preclude their chance for recovery if the lateness in lung cancer diagnosis and treatment is due to the patient's own negligence.) Failure of the health care provider to do further diagnostic testing in the presence of an unknown nodule on the chest film/CT puts the health care provider at risk for malpractice especially if later testing is done (usually when the patient becomes symptomatic) which shows evidence of lung cancer in the location of the nodule found at the earlier time.

B. Lung cancer is misidentified or missed.

In addition, a patient may have a misdiagnosis of their condition for lung cancer when the lung cancer is mistakenly misidentified or missed during radiological/pathology testing. It is not uncommon for a single primary nodule to be missed on a single chest x-

ray.⁷⁰ The radiologist may misread the chest film and/or CT scan as normal when the radiological test is actually abnormal. The question of course becomes was the lesion large enough or detectable so that the radiologist should have detected the lesion? This of course will be fact determinative and would be a question for your expert. Plaintiff's attorneys should know that there are many physicians who would not fault a radiologist for failing to diagnose a small lung nodule as found in the statement made in a Mayo clinic cancer study that "... failure to detect a small pulmonary nodule on a single examination should not constitute negligence or be the basis for malpractice litigation."⁷¹ In the case where the lung lesion was missed on radiographic testing, the lung cancer will probably be found on a subsequent radiologic test at the exact same location as the prior radiological test where the diagnosis was missed. Further the cancer found on the subsequent study will most likely have grown and spread when compared to the original study where the cancer was missed.

C. Lung Cancer Misdiagnosed By Pathologist

In addition, a pathologist may also have responsibility in the misdiagnosis of lung cancer. If a patient has testing done that involves sputum samples or lung tissue biopsy, the pathologist may misread the sputum cytology sample or biopsy sample as normal when in actuality cancer cells were present. Again, this would be a situation where the original sputum sample and/or biopsy sample would later be microscopically reviewed and cancer would be found. Another possible situation in which a pathologist may be liable for malpractice is when the pathologist actually knows there is cancer, but inaccurately stages the cancer so that the cancer treatment initiated is unsuccessful because it is the wrong type of treatment for the cancer type and stage the patient has, allowing for the further spread of the cancer.

IV. HANDLING A MEDICAL MALPRACTICE CASE INVOLVING THE MISDIAGNOSIS OF LUNG CANCER

A. INITIAL HISTORY

A careful history of your client is essential to learn your client's risk factors that may have predisposed them to lung cancer. These risk factors may increase the likelihood of comparative fault on your client as well as bias against your case by the insurance adjuster and/or trier of fact.

The following are areas to review with a prospective client when screening your potential misdiagnosis of lung cancer case:

⁷⁰ Austin M., *supra* note 13, at 115.

⁷¹ Muhm J, Miller R, Fontana R, *Lung Cancer Detected During a Screening Program Using Four-Month Chest Radiographs*, 148 RADIOLOGY 609 (1983).

1. Your client's smoking history/passive smoke history

The biggest risk factor associated with lung cancer is smoking. One in ten smokers will develop lung cancer in their lifetime.⁷² A person who smokes 1 pack per day over 20 years (which would equal a 20 pack year history) or smokes more than 1 pack per day for 20 years is considered high risk for developing lung cancer.⁷³ Of course, smoking for any period of time, even less than one pack per day for 20 years, increases a person's risk for developing lung cancer. There are recent studies and more research currently ongoing supporting that women may have a relatively higher risk for lung cancer than men after age adjustments and average daily smoking exposure are done.⁷⁴

Former smokers still have increased odds of developing lung cancer. Two recent surveys done at Brigham & Women's Hospital and University of Texas M.D. Anderson Cancer Center found that 50% of lung cancer patients seen at their facilities were former smokers.⁷⁵

It is also known that passive/involuntary smoking is an established risk factor for developing lung cancer.⁷⁶ The U.S. Environmental Protection Agency (EPA) concluded in a 1993 report that passive smoking causes 3000 lung cancer deaths a year in nonsmokers.⁷⁷ Questioning a prospective client regarding second hand smoke exposure is important.

The scientific evidence showing the dangers of smoking go back to epidemiological studies reported in the 1950s and 1960s that established a link between lung cancer and smoking.⁷⁸ It is now known that there are more than 3000 different chemicals and more than 40 known carcinogens in tobacco.⁷⁹

⁷² Thomas Petty & York Miller, LUNG CANCER-PRINCIPLES AND PRACTICE (Harvey Pass, et al. eds., 2d ed. Lippincott, Williams & Wilkins) at 400 (2000).

⁷³ *Id.*

⁷⁴ David Schottenfeld, LUNG CANCER-PRINCIPLES AND PRACTICE (Harvey Pass, et al. eds., 2d ed. Lippincott, Williams & Wilkins) at 368 (2000). Brownson R, Chang C, Davis J, *Gender and Histologic Type Variations in Smoking-Related Risk of Lung Cancer*, 3 EPIDEMIOLOGY 61 (1992). Risch H, Howe G, Jain M, et al., *Are Female Smokers at Higher Risk for Lung Cancer Than Male Smokers?*, 138 AM. J. EPIDEMIOLOGY 281 (1992). Zang E, Wynder E, *Differences in Lung Cancer Risk Between Men and Women: Examination of the Evidence*, 88 J. NATL CANCER INST. 183(1996).

⁷⁵ Khuir J, Spitz M, Hong W, *Lung Cancer Chemoprevention: Targeting Former Rather Than Current Smokers*, 2 CANCER PREV. INT. 55 (1995). Strauss G, *Measuring Effectiveness of Lung Cancer Screening From Consensus to Controversy and Back*, 112, 4S[Suppl] CHEST 216S (1997).

⁷⁶ Flehinger B, Melamed M, Zeman M, et al, *Early Lung Cancer Detection: Results of the Initial (Prevalence) Radiologic and Cytologic Screening in the Memorial Sloan-Kettering Study*, 130 AM. REV. RESPIR. DIS 555 (1984).

⁷⁷ www.lungusa.org/diseases/lungcanc.html. (visited January 3, 2001).

⁷⁸ Doll R, Hill A, *A Study of the Etiology of Carcinoma of the Lung*, 2 BR. MED. J. 1271 (1952). Levin M, Goldstein H, Gerhardt P, *Cancer and Tobacco Smoking: a Preliminary Report*, 143 JAMA 336 (1950).

⁷⁹ David Schottenfeld, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 74, at 370.

Smoking is dangerous to a person's health and the public is aware of the risks of smoking. Your client may not have known of the risks of smoking at the time he/she began smoking and became addicted to tobacco. These days juror bias against smokers needs to be taken into consideration when accepting a misdiagnosis of lung cancer case involving a smoker.

2. Age

Be sure to find out the age of your client. Only 5-10% of lung cancer diagnoses are made in people under the age of 50.⁸⁰

3. Job History

Don't overlook the occupational hazards connected with certain employment histories. Occupations with higher incidences of lung cancer include those occupations involving uranium mining, asbestos exposure, diesel exhaust, as well as exposure to arsenic, nickel, acrylonitrile, chromium, beryllium, cadmium, chloromethyl ether solvents, and possible silica.⁸¹ Working with certain types of insulation, as well as with coke ovens, repairing brakes, and jobs in the petroleum industry may increase the likelihood of lung cancer.⁸² When a person is exposed to environmental/job related carcinogens and smokes their risk of lung cancer is sharply increased.⁸³

4. Pre-existing respiratory problems.

Persons with a pre-existing history of tuberculosis, pulmonary fibrosis (as in silicosis), chronic bronchitis or emphysema (COPD) have an increased risk of developing lung cancer.⁸⁴

5. Indoor Radon Exposure

Indoor radon exposure at hazardous levels has also been found to lead to higher incidences of lung cancer. Radon is an invisible and odorless radioactive gas released by uranium that occurs naturally in rocks and soil and can be found in some homes in the United States as well as in mines.⁸⁵ Radon exposure along with smoking increases the risk of lung cancer.⁸⁶ By its own action, and in interaction with tobacco, radon exposure is

⁸⁰ David Schottenfeld, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 74, at 367.

⁸¹ Thomas Petty, et al. LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 8, at 400

⁸² www.lungusa.org/diseases/lungcanc.html. (visited January 3, 2001).

⁸³ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

⁸⁴ David Schottenfeld, LUNG CANCER-PRINCIPLES AND PRACTICE *supra* note 74, at 379.

⁸⁵ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

⁸⁶ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)

http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

considered to be the second leading cause of lung cancer in the U.S. today.⁸⁷

6. Family History or Prior History of Lung Cancer

There is evidence of increased incidents of lung cancer within families.⁸⁸ In addition, a person who has had lung cancer once is at increased risk to develop a second lung cancer.⁸⁹

7. HIV Infection

Patients with HIV often will develop lung cancer at a younger age and with less exposure to tobacco.⁹⁰

Additional areas of questions:

Be sure to inquire of your potential client in the screening process the following questions:

- 1. What type of cancer do they have?**
- 2. What is the staging and prognosis for their cancer?**
- 3. Where is the cancer located?**

These 3 questions may determine the chance of success you will have in pursuing a misdiagnosis of lung cancer case. If your client's staging of cancer at the time it was misdiagnosed was advanced you will have a very difficult time winning a causation argument made by the defense. In addition, it will probably be impossible to know the exact staging of the cancer at the time of misdiagnosis since usually you will have no cytology/biopsies from the location of the lesion on the date that the misdiagnosis occurred.

B. MEDICAL RECORDS

Prior to filing suit, you must obtain all of your client's past and present medical records concerning any potential lung problem. Be sure to obtain copies of all radiological studies performed, including copies of past chest films and CT scans from all facilities. In addition, if sputum cytology samples are in question, you may want to check and see if your own expert can review and test past sputum samples for lung cancer.

C. DEPOSING YOUR CLIENT

You should strongly consider videotaping your client's oral deposition and noticing it yourself early in your case. Many lung cancer patients will die during the pendency of litigation and you don't want to miss the opportunity to depose your client by videotape to preserve their testimony for the jury to see/hear at

⁸⁷ www.lungusa.org/diseases/lungcanc.html (visited on January 3, 2001) and *Lung Cancer* (posted August 1, 1999, visited January 5, 2001) http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

⁸⁸ Ann Schwartz, *LUNG CANCER-PRINCIPLES AND PRACTICE* (Harvey Pass, et al. eds., 2d ed. Lippincott, Williams & Wilkins) at 389 (2000).

⁸⁹ *Lung Cancer* (posted August 1, 1999, visited January 5, 2001) http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm

⁹⁰ Thomas Petty, et al. *LUNG CANCER-PRINCIPLES AND PRACTICE* *supra* note 8, at 400.

trial. Lung cancer patients often have rapid deteriorations in their condition. If your client's availability for deposition is in question prior to filing suit, you may want to take a videotaped oral deposition to perpetuate testimony prior to filing your medical malpractice case. Check with your state's civil procedure statutes to determine the requirements for filing suit to take a deposition to perpetuate testimony.

D. EXPERTS

A wide variety of experts with expertise in lung cancer will likely be needed to successfully prosecute a lung cancer misdiagnosis case. Experts in oncology, radiation oncology, radiology, pathology, and thoracic surgery may be necessary. In addition, vocational experts and economists may be needed to determine the loss of earnings/earning capacity of the client with lung cancer. Your case facts will determine what type of experts you will need. In addition, your medical expert(s) must link the misdiagnosis of lung cancer to the harm and damages claimed in your case.

E. DEFENSES

There are many defenses the plaintiff attorney handling a lung cancer misdiagnosis case will most likely encounter:

1. Comparative negligence of the Plaintiff

If your client has been a heavy smoker for many years there may be a bias that your client's lung cancer was caused by the client and therefore their recovery should be limited. It may be helpful to do focus groups or mock trials in your local area to determine the mindset of the local community to smokers who develop lung cancer.

2. Statute of Limitations

Often times the health care provider who missed the diagnosis will be able to raise a statute of limitations defense if the discovery of the lung cancer is beyond the proscribed statute of limitations date. Be sure to check your state's statute of limitations as well as any additional time period added onto the statute of limitations for subsequent discovery of the lung cancer. If your state allows for the filing of a medical malpractice case after the statute of limitations based upon discovery/constitutional grounds for access to the courts, be sure you do not delay in filing your client's case.

3. Causation issues – Including Loss of Chance/Lost Chance

Besides comparative negligence, the other defense you will most likely encounter is a causation defense. Did the health care provider's negligence proximately cause the ultimate harm to the patient?

The causation question may also include whether your jurisdiction allows a cause of action for loss of chance/lost chance. This cause of action

allows a plaintiff to recover for diminished chance of surviving or being cured from a disease, which has resulted from a health care provider's negligence. A cause of action for loss of chance/lost chance (hereafter "lost chance") will vary from jurisdiction to jurisdiction, so be sure to check your state's statutes and case law.

The landmark case in lost chance was a 1983 Washington Supreme Court decision, *Herskovits v. Group Health Corp.*, 664 P.2d 474 (Wash. 1983), in which lost chance for under 50% survival of the patient was first officially adopted. In the *Herskovits* case, Leslie Herskovits had lung cancer but the physician negligently failed to diagnose the cancer on the patient's first visit.⁹¹ The misdiagnosis of lung cancer resulted in a six-month delay in the correct diagnosis of lung cancer due to the defendants' negligence.⁹² During this six-month delay, the decedent's survival went from 39% to 25%.⁹³ The court allowed a proximate cause issue submission to the jury on the 14% chance of survival.⁹⁴ The court reasoned that "[t]o decide otherwise would be a blanket release from liability for doctors and hospitals anytime there was less than a fifty percent of survival, regardless of how flagrant the negligence."⁹⁵

The general principles for lost chance are outlined below. For more detailed discussion check law review information, case law and statutes of your state.

Many states have some version of the lost chance doctrine.⁹⁶ In these states, some measure of recovery is allowed for the reduction in the patient's being able to avoid the ultimate harm. (Usually in lung cancer cases, the ultimate harm is the patient's death from lung cancer.) There are many versions of lost chance. In some states, there is a "relaxed causation" approach that allows the fact finder a causation issue even though there is no evidence of a reasonable probability that the defendant's negligence caused the patient's death or ultimate harm.⁹⁷ Other states allow the case to be submitted to the fact-finder on the evidence that the defendant's negligence increased the risk of the ultimate harm.⁹⁸ Other states allow a hybrid lost chance doctrine by applying the relaxed causation approach while limiting damages to the value of the lost

⁹¹ *Herskovits v. Group Health Corp.*, 664 P.2d 474, 475 (Wash. 1983).

⁹² *Id.*

⁹³ *Id.*

⁹⁴ *Id.* at 479.

⁹⁵ *Id.* at 477.

⁹⁶ For a discussion of which states have lost chance, see discussion in *Kramer v. Lewisville Memorial Hosp.*, 858 S.W.2d 307 (Tex. 1993) at 400-402.

⁹⁷ *Id.*

⁹⁸ *Id.*

chance using a proportional damages approach or jury valuation approach.⁹⁹

Some states do not recognize lost chance. In some jurisdictions,¹⁰⁰ when the client's chance of survival is less than 50% there is no recovery and therefore no lost chance. In Texas, a plaintiff must prove by a reasonable medical probability or reasonable probability that the ultimate harm was caused by the negligence of the defendant(s).¹⁰¹ In states that do not recognize lost chance the reasoning is that the health care provider's negligent act/omission is not a substantial factor in bringing about the harm and than the harm would have occurred with or without the conduct of the health care provider. (In a lung cancer case, the defendant's argument would be that the cancer was too far advanced at the time of the malpractice and the patient would have had a 50% chance or less of survival had proper diagnosis and treatment been made.)

V. SUMMARY

The most important determiner in handling a medical malpractice case involving lung cancer is the facts of your case. Lung cancer is difficult to diagnose in its earliest and most treatable stages. Most patients will ultimately succumb to their lung cancer. Misdiagnosis of lung cancer cases are difficult to prosecute and the plaintiff attorney screening the potential case must make sure that the factual basis for his/her case is strong before filing suit. Having your client's complete health history, complete medical records and expert review will assist in successful screening of medical malpractice cases for misdiagnosis of lung cancer.

⁹⁹ *Id.*

¹⁰⁰ *Kramer v. Lewisville Memorial Hosp.*, 858 S.W.2d 307 (Tex 1993). For example, in Texas lost chance is not allowed for plaintiff's recovery if the plaintiff had less than a 50% chance of survival.

¹⁰¹ *Id* at 40.

VI.

DICTIONARY OF COMMON LUNG CANCER TERMS

Taken from *Lung Cancer* (posted August 1, 1999, visited January 5, 2001)
http://www.cancernet.nci.nih.gov/wyntk_pubs/lung.htm>

Dictionary

adenocarcinoma (AD-in-o-kar-sin-O-ma): Cancer that begins in cells that line certain internal organs and that have glandular (secretory) properties.

anesthetics (an-es-THET-iks): Substances that cause loss of feeling or awareness. Local anesthetics cause loss of feeling in a part of the body. General anesthetics put the person to sleep.

anterior mediastinotomy (MEE-dee-a-stin-AH-toe-mee): A procedure in which a tube is inserted into the chest to view the tissues and organs in the area between the lungs and between the breastbone and spine. The tube is inserted through an incision next to the breastbone. This procedure is usually used to get a tissue sample from the lymph nodes on the left side of the chest. Also called the Chamberlain procedure.

asbestos (as-BES-tus): A natural material that is made up of tiny fibers. The fibers can cause cancer.

aspiration (as-per-AY-shun): Removal of fluid from a lump, often a cyst, with a needle and a syringe.

benign (beh-NINE): Not cancerous; does not invade nearby tissue or spread to other parts of the body.

biopsy (BY-aph-see): A procedure used to remove cells or tissues to look at them under a microscope and check for signs of disease. When an entire tumor or lesion is removed, the procedure is called an excisional biopsy. When only a sample of tissue is removed, the procedure is called an incisional biopsy or core biopsy. When a sample of tissue or fluid is removed with a needle, the procedure is called a needle biopsy or fine-needle aspiration.

bone scan: A technique to create images of bones on a computer screen or on film. A small amount of radioactive material is injected into a blood vessel and travels through the bloodstream; it collects in the bones and is detected by a scanner.

bronchitis (bron-KYE-tis): Inflammation (swelling and reddening) of the bronchi.

bronchoscope (BRON-ko-skope): A thin, lighted tube used to examine the inside of the trachea and bronchi, the air passages that lead into the lungs.

bronchoscopy (bron-KOS-ko-pee): A procedure in which a thin, lighted tube is inserted through the nose or mouth. This allows examination of the inside of the trachea and bronchi (air passages that lead to the lung), as well as the lung. Bronchoscopy may be used to detect cancer or to perform some treatment procedures.

cancer: A term for diseases in which abnormal cells divide without control. Cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body.

carcinogen (kar-SIN-o-jin): Any substance that causes cancer.

catheter (KATH-I-ter): A flexible tube used to deliver fluids into or withdraw fluids from the body.

chemotherapy (kee-mo-THER-a-pee): Treatment with anticancer drugs.

clinical trial: A research study that tests how well new medical treatments or other interventions work in people. Each study is designed to test new methods of screening, prevention, diagnosis, or treatment of a disease.

cryosurgery (KRYE-o-SIR-ger-see): Treatment performed with an instrument that freezes and destroys abnormal tissues. This procedure is a form of cryotherapy.

CT scan: Computed tomography scan. A series of detailed pictures of areas inside the body; the pictures are created by a computer linked to an x-ray machine. Also called computerized axial tomography (CAT) scan.

epidermoid carcinoma (ep-I-DER-moyd kar-sin-O-ma): A type of cancer in which the cells are flat and look like fish scales. Also called squamous cell carcinoma.

external radiation (ray-dee-AY-shun): Radiation therapy that uses a machine to aim high-energy rays at the cancer. Also called external-beam radiation.

internal radiation (ray-dee-AY-shun): A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near the tumor. Also called brachytherapy, implant radiation, or interstitial radiation therapy.

IV: Intravenous (in-tra-VEE-nus): Injected into a blood vessel.

large cell carcinomas (kar-sin-O-mas): A group of lung cancers in which the cells are large and look abnormal when viewed under a microscope.

laser (LAY-zer): A device that concentrates light into an intense, narrow beam used to cut or destroy tissue. It is used in microsurgery, photodynamic therapy, and for a variety of diagnostic purposes.

lobe: A portion of an organ such as the liver, lung, breast, or brain.

lobectomy (lo-BEK-toe-mee): the removal of a lobe.

lymphatic system (lim-FAT-ik): The tissues and organs that produce, store, and carry white blood cells that fight infection and other diseases. This system includes the bone marrow, spleen, thymus, and lymph nodes and a network of thin tubes that carry lymph and white blood cells. These tubes branch, like blood vessels, into all the tissues of the body.

malignant (ma-LIG-nant): Cancerous; a growth with a tendency to invade and destroy nearby tissue and spread to other parts of the body.

mediastinoscopy (MEE-dee-a-stin-AHS-ko-pee): A procedure in which a tube is inserted into the chest to view the organs in the area between the lungs and nearby lymph nodes. The tube is inserted through an incision above the breastbone. This procedure is usually performed to get a tissue sample from the lymph nodes on the right side of the chest.

mediastinum (mee-dee-a-STYE-num): The area between the lungs. The organs in this area include the heart and its large blood vessels, the trachea, the esophagus, the bronchi, and lymph nodes.

metastasis (meh-TAS-ta-sis): the spread of cancer from one part of the body to another. Tumors formed from cells that have spread are called “secondary tumors” and contain cells that are like those in the original (primary) tumor. The plural is metastases.

MRI: Magnetic resonance imaging (mag-NET-ok REZ-o-nans IM-a-jing): A procedure in which a magnet linked to a computer is used to create detailed pictures of areas inside the body.

non-small cell lung cancer: A group of lung cancers that includes squamous cell carcinoma, adenocarcinoma, and large cell carcinoma.

oat cell cancer: A type of lung cancer in which the cells look like oats when viewed under a microscope. Also called small cell lung cancer.

pathologist (pa-THOL-o-jist): A doctor who identifies diseases by studying cells and tissues under a microscope.

photodynamic therapy (fo-toe-dye-NAM-ik): Treatment with drugs that become active when exposed to light and kill cancer cells.

pneumonectomy (noo-mo-NEK-toe-mee): An operation to remove an entire lung.

pneumonia (noo-MONE-ya): An inflammatory infection that occurs in the lung.

prophylactic cranial irradiation (pro-fih-LAK-tik KRAY-nee-ul ir-ray-dee-AY-shun): Radiation therapy to the head to reduce the risk that cancer will spread to the brain.

radiation therapy (ray-dee-AY-shun): The use of high-energy radiation from x-rays, neutrons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy) or from material called radioisotopes. Radioisotopes produce radiation and can be placed in or near a tumor or near cancer cells. This type of radiation treatment is called internal radiation therapy, implant radiation, or brachytherapy. Systemic radiation therapy uses a radioactive substance such as a radiolabeled monoclonal antibody that circulates throughout the body. Also called radiotherapy.

radioactive (RAY-dee-o-AK-tiv): Giving off radiation.

radionuclide scanning: A test that produces pictures (scans) of internal parts of the body. The person is given an injection or swallows a small amount of radioactive material; a machine called a scanner then measures the radioactivity in certain organs.

radon (RAY-don): a radioactive gas that is released by uranium, a substance found in soil and rock. When too much radon is breathed in, it can damage lung cells and lead to lung cancer.

resection (ree-SEK-shun): Removal of tissue or part of all of an organ by surgery.

respiratory system (RES-pih-ra-tor-ee): The organs that are involved in breathing. These include the nose, throat, larynx, trachea, bronchi, and lungs.

side effects: Problems that occur when treatment affects healthy cells. Common side effects of cancer treatment are fatigue, nausea, vomiting, decreased blood cell counts, hair loss, and mouth sores.

small cell lung cancer: A type of lung cancer in which the cells appear small and round when viewed under the microscope. Also called oat cell lung cancer.

sputum: Mucus coughed up from the lungs.

squamous cell carcinoma (SKWAY-mus...kar-sin-O-ma): Cancer that begins in squamous cells, which are thin, flat cells resembling fish scales. Squamous cells are found in the tissue that forms the surface of the skin, the lining of the hollow organs of the body, and the passages of the respiratory and digestive tracts. Also called epidermoid carcinoma.

surgery: A procedure to remove or repair a part of the body or to find out whether disease is present.

thoracentesis (thor-a-sen-TEE-sis): Removal of fluid from the pleural cavity through a needle inserted between the ribs.

thoracotomy (thor-a-KAH-toe-mee): An operation to open the chest.

tissue (TISH-oo): A group or layer of cells that are alike in type and work together to perform a specific function.

tumor (TOO-mer): An abnormal mass of tissue that results from excessive cell division. Tumors perform no useful body function. They may be benign (not cancerous) or malignant (cancerous).

x-ray: High-energy radiation used in low doses to diagnose diseases and in high doses to treat cancer.