CE Objectives and Evaluation Form to appear on page 175.
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CE SERIES

Lung Cancer Epidemiology

Linda H. Yoder

In the last year, lung cancer has come to the attention of the American public with the lung cancer diagnoses and deaths of Peter Jennings and Dana Reeves. Many nurses do not understand the specific epidemiology and pathophysiology of lung cancer unless they are caring for patients with these dianoses. Therefore, the purpose of this column is to review major epidemiologic concepts related to lung cancer and new national initiatives targeting this deadly disease. In the August issue, the basic pathophysiology of lung cancer will be presented.

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Lung cancer remains the leading cause of cancer-related deaths in both men and women worldwide as well as in the United States, with 174,470 estimated newly diagnosed cases and 162,460 deaths occurring in the United States in 2006 (Jemal et al., 2006). It is one of the few diseases in which a carcinogen has been directly linked to the development of cancer; smoking avoidance could almost completely eliminate the disease. Recent advances in technology have enabled earlier diagnosis, and advances in surgery, radiation therapy, and chemotherapy have produced improved response rates, but overall survival has not been affected significantly in 30 years (Knop, 2005).

Risk Factors

The association of smoking with the development of lung cancer is one of the most thoroughly documented, strong causal relationships in biomedical research (Alberg & Samet, 2003). In a study of 70 nations, tobacco use was ranked as the fourth most preventable health risk behind malnutrition, unsafe sex, and high blood pressure. Currently lung cancer is the leading cause of preventable death in women (Twombly, 2003). Smokers have a 20-fold increased risk of developing lung cancer than never-smokers, with 85%-90% of all lung cancers being directly linked to tobacco exposure (Alberg & Samet, 2003; Ruano-Ravina, Figueiras, & Barros-Dios, 2003). The risk for developing lung cancer increases with younger age at initiation of smoking, greater number of years of smoking, and greater number of cigarettes smoked per day (Winterhalder, Hirsch, Kotantoulas, Franklin, & Bunn, 2004). Women smoking the same amount as men have twice the risk of developing lung cancer (Siegfried, 2001). Since 1993, cigar smoking has increased in popularity, especially among young adult men; with this increased popularity has come a 5.1 relative risk of dying from lung cancer compared to people who have never smoked (Shapiro, Jacobs, & Thun, 2000). The complicated scientific basis for the relationship between smoking and lung cancer continues to be investigated and unraveled.

Tar, the condensable residue of cigarette smoke, and includes many chemicals that are initiators and/or promoters in the development of lung cancer. This fact

makes tobacco a complete carcinogen (Alberg & Samet, 2003). Environmental tobacco smoke (ETS) is a complex mixture of smoke that was classified as a human carcinogen in 1992 by the Environmental Protection Agency (EPA). Exposure to ETS accounts for about 3,000 deaths each year in the United States (Alberg & Samet, 2003). In a study reported by de Andrade et al. (2004), 82% of never-smokers who presented with lung cancer had exposure to ETS. Also, never-smokers had a higher exposure than nonsmokers to ETS in childhood.

Only 15% of heavy smokers develop lung cancer; therefore, genetic polymorphisms that cause carcinogens to accumulate in any individual are highly suspect in contributing to the development of lung cancer. A family history of lung cancer has been associated with an increased risk. The genes most associated with lung cancer are *CYP1A1*, *CYP2D6*, and *GSTM1*. The risk of developing lung cancer is higher in people younger than age 59 with a history of lung cancer among first-degree blood relatives. First-degree blood relatives of any person with cancer have a 2.4 fold increased risk of developing lung cancer, and lung cancer is more common in those families with a history of breast or ovarian cancer (Ruano-Ravina et al., 2003).

In 2000, the EPA, the World Health Organization, and the U.S. Department of Health and Human Services classified radon as a human carcinogen. Indoor radon exposure is the second leading cause of lung cancer, accounting for 10% of cases and 3,000-32,000 deaths annually in the United States (Alberg & Samet, 2003; Duckworth, Frank-Stromborg, Oleckno, Duffy, & Burns, 2002).

Occupational exposure to carcinogens accounts for 9%-15% of lung cancer cases (Alberg & Samet, 2003). Occupations with a known risk of lung cancer include uranium mining, chemical exposures, asbestos production, refineries, foundries (handling of metals), construction, painting, shipbuilding, motor vehicle manufacturing, wood-production related activities, rubber, ceramic and brick production, and exposure to diesel exhaust (taxi and bus drivers). The risk for the development of lung cancer sharply increases when exposure in these occupations is combined with smoking. Other risk factors that have been linked with a higher risk of lung cancer are indoor pollution, dietary factors, preexisting pulmonary disease (chronic obstructive pulmonary disease, tuberculosis, and silicosis), and treatment with alkylating agents and radiation therapy for Hodgkin's disease (Ruano-Ravina et al., 2003; Van Cleave & Cooley, 2004).

The Report Card on Lung Cancer

In January 2006, the Lung Cancer Alliance (LCA) issued the first *Report Card on Lung Cancer,* an assessment of the progress being made in the fight against this disease. This report card created benchmarks that will be used to evaluate progress annually, and to inform public health leaders and the American public regarding the status of lung cancer as the #1 cancer killer. The *Report Card on Lung Cancer* graded seven categories as follows (LCA, 2006):

- *Number of deaths.* Lung cancer kills three times as many men as prostate cancer, nearly twice as many women as breast cancer, and more than twice as many men and women as colorectal cancer. Approximately 172,570 people were diagnosed with lung cancer in 2005 and 163,510 died *(Grade = F).*
- *Five-year survival rate.* Only 15% of those people diagnosed with lung cancer live longer than 5 years. There has been virtually no improvement in the 5-year survival rate since 1971, when President Nixon and Congress declared *"War on Cancer."* By comparison, the 5-year survival rate for breast cancer is now 88% and prostate cancer is 99% *(Grade = F).*
- *Number of late-stage diagnoses.* A late-stage diagnosis is a lethal diagnosis and 70% of lung cancer diagnoses are late stage *(Grade = F).*
- *Newly addicted youth smokers.* About 2,000 new daily smokers under the age of 18 become addicted each day, totaling more than 700,000 per year *(Grade = F).*
- *Number of new treatment and diagnostic options in the last 30 years.* Slight progress has been made only within the last few years; much more work must be done *(Grade = D).*
- *Federally supported early detection program.* The federal government does not support early screening for lung cancer, but it does for other major cancers with comparable public health service ratings *(Grade = F).*
- *Overall federal commitment.* There is a lack of an overall plan and sense of urgency. Lung cancer is under-funded and under-researched. Only $1,829 is spent per lung cancer death, compared to $23,000 per estimated breast cancer death and $14,369 per estimated prostate cancer death *(Grade = F).*

To address the problems benchmarked in the *Report Card on Lung Cancer*, the LCA plans to advocate for increased research dollars by engaging and educating key policymakers at the state and

Table 1.
Strategies for Increasing Lung Cancer Research, Detection, and Treatment

National Cancer Institute	• Increase the amount of research funding per death for lung cancer to the average amount per death being spent on breast, prostate, and colon cancer research with particular emphasis on early detection programs. • Lay out precisely how lung cancer mortality rates will be reduced by 50% within 10 years. • Increase the number of lung cancer Specialized Programs of Research Excellence (SPOREs) to 10.
Departments of Defense and Veterans Affairs	• Start a coordinated lung cancer screening and early detection program for current and retired military personnel who participated in the Korean, Vietnam, Gulf, and Iraq Wars.
Centers for Disease Control	• Relocate lung cancer to the Division of Cancer Prevention and Control and enhance public information and data collection programs for lung cancer.
Department of Justice	• Include funding for lung cancer research and early detection in its suit and any settlement negotiated in the U.S. Government versus Philip Morris et al.
Food and Drug Administration	• Keep all drugs for late-stage lung cancer accessible to patients and their doctors. • Work with the NCI to expedite the development of chemoprevention drugs for lung cancer.
Department of Energy	• Increase funding for the occupational early lung cancer detection program in the nuclear weapons industry.

Source: Lung Cancer Alliance, 2006

federal levels to promote an increased funding commitment for this disease. Additionally, the LCA indicates the vicious circle of low survival rates and low research dollars must be broken and federal agencies must address the issues outlined in Table 1 (LCA, 2006).

A new initiative at the National Cancer Institute (NCI) is the *Lung Cancer Integration and Implementation (12) Team* (2006). The team's business plan notes that there is no single operational focus within the NCI dedicated to lung cancer initiatives in prevention, diagnosis, and therapy. To that end, the team's plan is divided into three major strategies: tobacco control, early detection and treatment of *early* lung cancer, and new drug development and imaging of response to therapy, such as introducing new targeted therapies. In 2006, the NCI plans to conduct 1-2 workshops, which would be the first steps toward asking researchers to submit proposals for funding in these areas of interest. *The Lung Cancer Integration and Implementation (12) Team* is funded at $8.35 million for 2006, with planned alloca-

Table 2.
Web Sites with Information about the Epidemiology of Lung Cancer and Prevention Programs

- ❏ http://www.lungcancer.org/
  Sponsored by CancerCare
- ❏ http://www.cancer.gov/cancertopics/types/lung
  The National Cancer Institute
- ❏ http://www.lungcanceronline.org/
  LungCancerOnline Foundation
- ❏ http://www.lungusa.org
  American Lung Association
- ❏ http://www.cancer.org/docroot/CRI/CRI_2x.asp?sitearea=LRN&dt=26
  American Cancer Society
- ❏ http://www.4woman.gov/faq/lung.htm
  U.S. Department of Health & Human Services
- ❏ http://www.c-changetogether.org/
  C-Change
- ❏ http://www.mskcc.org/mskcc/html/12463.cfm
  The Memorial Sloan-Kettering Cancer Center

tions for the same amount in 2007-2010; this amount of funding represents only a 3% increase in lung cancer research funding since 2004 (NCI, 2006).

Helpful Internet Sites

The Memorial Sloan-Kettering Cancer Center Web site contains a Lung Cancer Risk Assessment (see Table 2). This prediction tool can assess a long-term smoker's risk of developing lung cancer in the next 10 years based on the person's age, sex, smoking history, and asbestos exposure. Knowing about risk can help clinicians and patients make decisions about health care, such as whether to get screened for lung cancer. Researchers at Memorial Sloan-Kettering Cancer Center, in collaboration with the Fred Hutchinson Cancer Research Center, developed and tested this risk assessment tool. The tool is based on data from the Carotene and Retinol Efficacy Trial (CARET), a large, randomized trial on lung cancer prevention. More information about the development of this tool is available in Bach et al. (2003). Other Web sites that contain information about the epidemiology of lung cancer and prevention are listed in Table 2.

Clearly the first step for nurses is to be aware of the risk factors for lung cancer in order to educate patients and family members. Additionally, nurses must set an example for risk reduction; this includes *not smoking*, discussing smoking cessation options with patients and family members, being aware of occupational exposure risks in the community that may affect patients and family members, and being aware of clinical trials and state-of-the-art prevention and treatment options. Clinical care for adults with lung cancer and their families may span the care continuum from prevention through active treatment and recovery to progression of disease, supportive care, and hospice (Van Cleave & Cooley, 2004). ■

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Lung Cancer Epidemiology

This test may be copied for use by others.

COMPLETE THE FOLLOWING:

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Address: _____

City: _____State: _____Zip:_____

Preferred telephone: (Home)_____ (Work)_____

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Answer Form:

1. If you applied what you have learned from this activity into your practice, what would be different?

_____

_____

_____

_____

Evaluation	**Strongly disagree**				**Strongly agree**
The offering met the stated objectives.					
2. By completing this activity, I was able to meet the following objectives:					
a. Discuss risk factors associated with lung cancer.	1	2	3	4	5
b. Describe progress in fighting lung cancer.	1	2	3	4	5
c. List Web sites related to lung cancer epidemiology and prevention.	1	2	3	4	5
3. The content was current and relevant.	1	2	3	4	5
4. The objectives could be achieved using the content provided.	1	2	3	4	5
5. This was an effective method to learn this content.	1	2	3	4	5
6. I am more confident in my abilities since completing this material.	1	2	3	4	5

7. The material was (check one) ___new ___review for me

8. Time required to complete the reading assignment: _____minutes

I verify that I have completed this activity: _____

Comments

_____

_____

Objectives

This educational activity is designed for nurses and other health care professionals who care for and educate patients and their families regarding lung cancer epidemiology For those wishing to obtain CE credit, an evaluation follows. After studying the information presented in this article, the nurse will be able to:

1. Discuss risk factors associated with lung cancer.
2. Describe progress in fighting lung cancer.
3. List Web sites related to lung cancer epidemiology and prevention.

CE Instructions

1. To receive continuing education credit for individual study after reading the article, complete the answer/evaluation form to the left.

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3. Test returns must be postmarked by June 30, 2008. Upon completion of the answer/evaluation form, a certificate for **1.0** contact hour(s) will be awarded and sent to you.

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