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Lung Cancer Screening in a Primary Care Clinic for Coal Mine

glenda mills

Sarah Cobb

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Executive Summary

Introduction

Lung cancer is the leading cause of cancer mortality in the United States. Coal miners are at an increased risk of developing lung cancer due to the work conditions of the mines, such as toxic chemicals, dust pollution from coal, and diesel exhaust fumes (American Lung Association, 2022a, Centers for Disease Control and Prevention [CDC], 2022a). The Coal Workers' Health Surveillance Program, provided for by the Federal Coal Mine Health and Safety Act of 1969, provides mobile testing units that provide screening for coal worker pneumoconiosis (aka "black lung disease") with chest x-rays. Current screening guidelines focus on cigarette smoking as the main cause of lung cancer; however, despite known risk factors for patients, screening tools are underutilized in primary care settings, and at-risk patients are not receiving the recommended low-dose CT scans that would detect early signs of lung cancer (Doubeni et al., 2020).

Literature Review

Of all the cancers, lung cancer has the highest rate of cancer mortality for both men and women in the United States (American Lung Association, 2022a). Coal miners with 15 years or more of experience are shown to have a higher incidence of lung cancer (Jenkins et al., 2013). Environmental conditions in the mine, such as radon, air pollution, diesel exhaust, and chemicals contribute to the increased risk of lung cancer as does the bituminous coal found in Illinois mines (American Geosciences Institute, 2021; Centers for Disease Control and Prevention [CDC], 2022a). Bituminous coal has demonstrated an absolute risk of lung cancer death before age 70 in men by 18% and women by 20% if burned in the home vs. anthracite coal (Barone-Adesi, 2012).

The National Institute for Occupational Safety and Health (NIOSH) provides screenings for black lung disease to coal mines via pulmonary function tests, work history screenings, respiratory health questionnaires, blood pressure screenings, and x-rays (CDC, 2023). However, despite a major cause of lung cancer being cigarette smoking, this is not something addressed in the NIOAH screenings. The screening is offered by NIOSH via mobile vans that travel to coal mines in areas on the East Coast, but not to ones located in Illinois (National Institute for Occupational Safety and Health [NIOSH], 2023). The American Cancer Society recommends screening for ages 50-80 years old, currently smoke or have quit smoking in the last 15 years and have a 20-pack-year history of smoking (such as 1 pack a day for 20 years or 2 packs a day for 10 years) (American Lung Association, 2023).

Low-dose CT scans have been linked to a 20% decrease in lung cancer deaths versus screening with chest x-rays alone, but only 6% of patients receive the scan despite indications (Cui et al, 2015; Doubeni et al., 2020). Low-dose CT scans allow for the detection of lung cancer in early stages and can improve patient outcomes with earlier treatment (American Cancer Society, 2023a).

Overcoming patient and provider perception is important when screening for lung cancer, as bias prevents patients from seeking care and prevents providers from offering care. Cigarette smoking is stigmatized and is one of the factors that patients cite as leading them to refuse radiological screening (Hamann et al., 2018). Quaife et al. (2017) found that participants considered lung cancer to be a “death sentence” and doubted if treatment would be effective. The relationship a primary care provider forms with a patient can help alleviate some of the skepticism and fear patients may have toward screening (Doubeni et al., 2020).

Project Methods

The project goal was to increase provider awareness of screening tools for lung cancer screening and increase the use of those tools for patients who fit the criteria guidelines as set forth by the American Cancer Society and American Lung Association. This quality improvement project was submitted for IRB approval at Southern Illinois University Edwardsville. This project was deemed exempt status by SIUE (Southern Illinois University Edwardsville) IRB.

The original project site was at a coal mine and served coal miners and their families as their primary care. However, the coal mine clinic temporarily closed, and the project site was moved to a primary care clinic in Southern Illinois in a regional hospital system that served coal miners, their families, and other residents in the area. Prior to implementation, the clinic did not screen for lung cancer on a routine basis, and further screening was not routinely offered to patients who would have met lung cancer screening guidelines had they been used. The project's goal was to increase provider awareness of lung cancer risks and screening guidelines and to identify and provide education to at-risk patients with the option of further screening.

A brochure provided by the American Lung Association about lung cancer screenings was distributed to patients meeting the following criteria: ages 50-80, current smoking status (or having quit smoking within the last 15 years), and a 20-pack history of smoking. Patients were also educated by the provider on the importance of further testing. Patients were offered low-dose CT scans if they met the qualifying criteria outlined by the American Lung Association.

Evaluation

The primary outcome of interest was improved patient and healthcare provider awareness of lung cancer screenings available to high-risk individuals including but not limited to coal miners. Quantitative and qualitative data collected included the number of patients seen in the

clinic each day, the age of each patient seen, if the patient was a coal miner, smoking status, and if a smoker, duration of past and current smoking history, and patient eligibility for CT screening. If a patient was found eligible for a CT screening, qualitative data was collected on if an educational brochure was provided, if the patient received a screening CT scan, and CT scan results if applicable, and if a CT was not obtained the reason for declination. The collected and deidentified patient data was stored in a password-protected Microsoft Excel spreadsheet tracking the number of patients seen over a two-week implementation period. The data was provided by the primary provider/external stakeholder and was gathered from the EMR via the provider and/or clinic staff. Only members of the project team or clinic staff had access to the patient data. All HIPAA guidelines were followed.

Results

The data from the password-protected Microsoft Excel spreadsheet was analyzed. We evaluated the data collected in each respective column for each implementation day. We used the statistical programs offered in the Microsoft Excel spreadsheet to analyze the collected data. The provider reported seeing an average of eight patients each day for 112. During the 14-day implementation period, the provider documented information on 20 patients who were within the recommended age range for screening noted in Table 1. Of the 20 patients who were within the recommended age range of 50 to 80 years old, 30% (n=6) were current smokers or had quit within the last 15 years, 55% (n=11) were former smokers quitting over 15 years ago, and 15% (n=3) report never smoking (Table 1). Regarding smoking status alone, 30% (n=6) met a portion of the eligibility criteria for lung cancer screening. Of the 30% (n=6) who were current smokers or had quit within the last 15 years, 50% (n=3) had a 20-pack-year history, 33% (n=2) had less than a 20-pack-year history, and 17% (n=1) did not specify how long they had been smoking. Of

the 20 patients, 30% (n=6) met the eligibility requirements for an LDCT (Low Dose Computed Tomography) to screen for lung cancer. The brochure was provided to four of the six eligible patients (67%). The two others did not receive the brochure because one was currently being evaluated at an outside hospital at the time and the other patient refused the brochure. No patients followed through with the recommended CT scan screening. One of the 20 patients was in hospice, so declined the brochure and was unable to complete the screening. Of the 20 patients within the appropriate age range, 15% were coal miners (n=3), but none of them met all the eligibility requirements for screening. [OBJ]

Table 1

Patient Eligibility/Characteristics

Total Number of Patients Seen	112
Eligible Patients Based on Age Alone	20
<i>Characteristics of Sample (n=20)</i>	
Characteristics	Respondents N (%)
Age (years)	
50 - 80 y/o	20 (100%)
Smoking Status	
Current Smoker/Quit <= 15 years ago	6 (30%)
Former Smoker/Quit >= 15 years ago	11 (55%)
Never Smoker	3 (15%)
20-pack-year History	
Yes	14 (70%)
No	5 (25%)
Unspecified/Unknown	1 (5%)
Meets Eligibility Criteria	

Yes	6 (30%)
No	14 (70%)

Coal Miner

Yes	3 (15%)
No	17 (85%)

Impact on Practice

Lung cancer is a risk faced by many patients and early detection is key to curative treatment. The clinic site now has the tools to permit future screening of eligible patients who are at risk for developing lung cancer. The brochure provides an easy-to-understand tool that patients can refer to when considering the risks of lung cancer. The long-term impact will be the clinic using the tools to appropriately screen patients and to have a conversation about future screenings. This could lead to early detection and treatment of lung cancer which has been linked to improved health outcomes for patients (Cui et al., 2015). Increased discussion about lung cancer, the risks, and the benefits of screening may lead to increased patient receptiveness to further lung cancer screenings.

Conclusions

Providers are better able to initiate a conversation about lung cancer screenings with patients using the brochure that states information in an easy-to-read format. Increased screening and increased awareness can lead to earlier detection of lung cancer among at-risk populations. While participants did not seek additional screening during this project's implementation, it is hopeful that other patients will become aware of the risks of lung cancer and be willing to seek additional screening.

Author Contact Information

glakin@siue.edu

scobb@siue.edu