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# The Impact of Lung Cancer Screening Education on Knowledge and Screening Rates in a Kentucky Cancer Survivorship Clinic

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# The Impact of Lung Cancer Screening Education on Knowledge and Screening Rates in a Kentucky Cancer Survivorship Clinic

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By

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## Abstract

**Background:** Lung cancer is a significant problem in Kentucky, which ranks fourth in the nation in adults who currently smoke. Early detection, through lung cancer screening, can prevent untimely deaths. Several barriers to screening exist including lack of knowledge and awareness among patients regarding lung cancer screening. By increasing knowledge, at risk patients can take the necessary steps to decrease incidence of late stage diagnoses.

**Purpose:** The purpose of this project was to evaluate patients' knowledge of lung cancer screening and referral and screening rates before and after one-on-one patient education.

**Methods:** This was a quality improvement project that used a quasi-experimental one group pre-test, post-test design. A pre-chart review determined participant eligibility. Baseline data were obtained through a pre-survey. After appointment, cancer survivors participated in an individual lung cancer screening educational intervention. Post intervention, change in knowledge, willingness to be screened, referral rates, and screening rates were measured. A retrospective chart review examined screening rates and chest CT results.

**Results:** A total of eight patients participated in this project. Overall, there was an increase in all mean values from pre-survey to post-survey. The increase was statistically significant for one item. The mean score for "I know something about lung cancer screening" significantly increased from 3.5 (*SD*=1.41) before intervention to 4.9 (*SD*=0.35) after intervention, $p$=.028. A retrospective chart review could not evaluate the effect of the educational intervention on lung cancer screening referrals and screening rates post intervention, as 100% of participants received a chest CT scan prior to the intervention per oncology surveillance guidelines. However, a retrospective chart review analyzed the results from these scans. The retrospective chart review found that four participants (50.0%) had no pulmonary nodules, two (25.0%) had stable

pulmonary nodules, one (12.5%) had a new nodule, and one (12.5%) had nodules that had increased in size.

**Conclusion:** An educational intervention with a concurrent decision aid can be an effective way to improve lung cancer screening knowledge. Although most participants had heard of lung cancer screening and knew they were eligible prior to intervention, they were lacking knowledge about lung cancer screening. Education not only improves knowledge but positively impacts interest and willingness to be referred for screening. Analyzing chest CT scan results indicated the importance of lung cancer screening for asymptomatic, high-risk individuals.

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## Background and Significance

Lung cancer is a significant problem in Kentucky and throughout the country. The American Cancer Society (2024a) estimates that 234,500 Americans will be diagnosed with lung cancer in 2024. Rates of new cases vary by state and approximately 5,120 Kentuckians will be diagnosed with lung cancer and 2,630 will die from the disease in 2024 (American Cancer Society [ACS], 2024a). Lung cancer costs an estimated $23.8 billion nationally (National Cancer Institute [NCI], 2023). The financial burden of lung cancer varies for each phase of care and needed treatment services. Annually, individual medical services related to lung cancer costs an average of $68,293.30 for initial care, $12,388.60 for continued care, and $110,247.80 for last year of life care (NCI, 2023). In the United States, lung cancer is the second most common cancer; however, it is the leading cause of cancer death (ACS, 2024b). Lung cancer accounts for one in five cancer deaths, claiming the lives of more patients than breast, prostate, and colon cancers combined (ACS, 2024c).

Smoking is the leading cause of lung cancer, contributing to 80-90% of lung cancer deaths (Centers for Disease Control and Prevention [CDC], 2023a). In Kentucky, tobacco use is a significant problem; at 19.6%, Kentucky ranks fourth behind West Virginia, Arkansas, and Tennessee in the percentage of adults who currently smoke (American Lung Association, 2024). As Kentuckians are at an increased risk of lung cancer, early detection is crucial in saving lives. Nationally, when diagnosed early, five-year survival is 63%; however, approximately 44% of lung cancer diagnoses occur too late, leading to a survival rate of only 8% (American Lung Association, 2024). Unfortunately, Kentucky ranks below average in early lung cancer diagnoses, with only 24.8% of cases discovered early (American Lung Association, 2024).

Therefore, the state loses too many Kentuckians to lung cancer annually. One way to prevent untimely death is through lung cancer screening.

**Current Evidence Based Intervention**

Lung cancer screening is the solution to identifying lung cancer in patients at risk. Lung cancer screening utilizes low dose computed tomography, or CT, to detect the presence of lung cancer in asymptomatic, high-risk individuals (CDC, 2023b). Current eligibility criteria for lung cancer screening include adults aged 50 to 80, with a 20-pack year or more smoking history, who currently smoke or have quit in the last 15 years (CDC, 2023b; United States Preventative Services Task Force [USPSTF], 2021). The USPSTF recommends annual screening, as it can significantly reduce morbidity and mortality. In fact, research shows annual low dose CT lung cancer screening can decrease mortality by 20% (American Lung Association, 2024; The National Lung Screening Trial Research Team, 2011).

Even though lung cancer screening is vital for early detection, several barriers exist. Barriers include fear of unnecessary radiation, fear of diagnosis, taking time off work, other competing chronic conditions, cost, lack of provider awareness, and lack of patient awareness (Cavers et al., 2022). Improving awareness is key to improving lung cancer screening. A survey by the American Lung Association (2022a) found that approximately 70% of patients were unaware of lung cancer screening for early disease detection. In 2022, 14.2 million Americans met the criteria for lung cancer screening, but only an estimated 5.8% were screened (American Lung Association, 2022b). Although Kentucky ranked above the national average, with 10.6% of high-risk individuals getting screened for lung cancer in 2023 (American Lung Association, 2024), almost 90% of those eligible are still not getting their preventative lung cancer screening.

Education to increase patient awareness is an important strategy to improve lung cancer screening performance.

**Problem Statement**

As lung cancer causes considerable burden for both patient and family, early diagnosis is critical. Unfortunately, due to lack of knowledge and awareness, patients are not utilizing preventive screening services for early detection. Increased knowledge and awareness, through lung cancer screening education, allows eligible patients to be better advocates for their health.

## Purpose and Objectives

The purpose of this project was to evaluate patients' knowledge of lung cancer screening and referral and screening rates before and after one-on-one patient education.

The objectives were:

1. Develop and implement an educational intervention to improve lung cancer screening knowledge among cancer survivorship patients.
2. Evaluate the effect of an educational intervention to improve patients' lung cancer screening knowledge via pre-survey and post-survey results.
3. Evaluate the effect of an educational intervention on lung cancer screening referrals and screening rates post intervention.

## Theoretical/Conceptual Framework or Model

The model used to guide this project was the health belief model. The health belief model helps explain why individuals either accept or reject positive health behaviors, such as preventative screenings. For patients to participate in lung cancer screening, various components must align. Components of the health belief model include perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and cue to action (LaMorte, 2022;

Rosenstock, 1974). Perceived susceptibility involves the patient's perception of their risk of a specific disease condition. Those who understand their increased risk of developing lung cancer are more likely to be screened (Rosenstock, 1974). Perceived seriousness refers to the patients' perceptions of the consequences and impact of a disease. Those who recognize the severity of lung cancer are more likely to undergo screening (Rosenstock, 1974). Perceived benefits increase screening likelihood, as patients understand screening effectiveness. Perceived barriers inhibit screening likelihood, as obstacles such as cost or time impact screening rates. Finally, a cue to action allows patients to recognize the importance of lung cancer screening.

Components of the health belief model guided the creation and implementation of the educational intervention. The intervention was directed at showing benefits of lung cancer screening and finding ways to remove barriers. Along with perceived benefits and barriers, the intervention aimed at educating patients on their risk of developing lung cancer and its consequences. Patient susceptibility was included when reviewing eligibility guidelines; whereas, discussion of the severity of lung cancer and impact of screening hoped to impact perceived seriousness. The educational intervention and associated decision aid provided patients with an external cue to action. As seen in the literature, an external cue to action, such as education, is critical in providing patients and their families the confidence to initiate lung cancer screening.

## Review of Literature

A review of literature was conducted to examine the evidence on the implementation of lung cancer screening educational interventions. The question guiding the review was: In patients meeting lung cancer screening criteria, does lung cancer screening education improve lung cancer screening knowledge and screening rates compared to no education?

The CINAHL, PubMed, and PsychINFO databases were searched for articles examining lung cancer screening education. Searches utilized a combination of terms including lung cancer, (lung cancer), neoplasm, (lung cancer screen*), screen*, educat*, know*, tool*, aware*, shared decision making, measur*, implement*, survivor*, pre-post, improv*, decision aid, and assess*. Keyword and title searches were used to locate the best evidence. The Boolean phrase AND was included in each search. Inclusion criteria were: English-language publication in an academic journal between 2018-2023, focus on patient education, and performed in the United States, Europe, Canada, or Australia. Articles were excluded if they were not written between 2018-2023, not published in English, focused on physician education, were opinion articles, included education on screenings for cancers other than lung cancer, and not performed in the United States, Europe, Canada, or Australia.

Nine studies were analyzed and included a systematic review (Saab et al., 2021), a cohort study (Donin et al., 2019), a prospective one group mixed methods pilot study design (McDonnell et al., 2018), a single group pilot design (Williams et al., 2021), a quality improvement evaluation design (Sakoda et al., 2020), and one group pre-test, post-test quasi-experimental designs (Bouchard et al., 2022; Housten et al., 2018; Reuland et al., 2018; Soto et al., 2022). The research studies took place throughout the United States (Bouchard et al., 2022; Donin et al., 2019; Housten et al., 2018; McDonnell et al., 2018; Reuland et al., 2018; Sakoda et al., 2020; Soto et al., 2022; Williams et al., 2021) in various community, institutional, and primary care settings.

**Synthesis of the Evidence**

Increasing knowledge through lung cancer screening educational interventions is essential to improving screening rates. Researchers analyzed several approaches for providing

lung cancer screening education, including community educational programs (Bouchard et al., 2022; Saab et al., 2021; Williams et al., 2021), education classes (Bouchard et al., 2022; Saab et al., 2021; Sakoda et al., 2020; Williams et al., 2021), one-on-one telephone education (Bouchard et al., 2022), web-based programs (Saab et al., 2021), and video-based education (Housten et al., 2018; Reuland et al., 2018; Saab et al., 2021). These interventions aimed to increase knowledge and screening intention, while decreasing barriers and stigma (Bouchard et al., 2022; Housten et al., 2018; Reuland et al., 2018; Saab et al., 2021; Sakoda et al., 2020; Soto et al., 2022; Williams et al., 2021). Regardless of delivery mode, education significantly improved patients' lung cancer screening knowledge. Not only did education impact knowledge, but community education programs and education classes led to decreased fear and increased screening uptake (Bouchard et al., 2022; Saab et al., 2021; Sakoda et al., 2020; Williams et al., 2021).

Incorporating decision aids throughout educational sessions was very useful. Decision aids are evidence-based, educational tools that inform patients about healthcare services or treatment options and associated risks and benefits (Reuland et al., 2018). Decision aids were not intended to replace education, but used to improve discussion and shared decision making. Research showed decision aids further increased lung cancer screening knowledge (Housten et al., 2018; McDonnell et al., 2018; Reuland et al., 2018; Saab et al., 2021).

As with the general population, most cancer survivors are unaware of lung cancer screening (Soto et al., 2022). Patients in remission from bladder, head, and neck cancers are particularly more susceptible to lung cancer due to incidence of tobacco use (Donin et al., 2019; Soto et al., 2022). As all cancer survivors are at an increased risk of developing secondary malignancy, education and screening programs are vital to implement within survivorship clinics.

## Summary of the Evidence

Overall, based on the strength of the evidence, there is a strong recommendation for lung cancer screening education. Incorporated articles had levels I, III, IV, and VI evidence (Melnyk & Fineout-Overholt, 2019).

## Gaps Identification and Need for Proposed Practice Change

Late-stage lung cancer diagnoses can lead to significant morbidity and mortality. One way to combat these late-stage diagnoses is through lung cancer screening. However, few eligible patients actually receive lung cancer screening, as there is a substantial lack of awareness about this preventative service (American Lung Association, 2022a; American Lung Association, 2022b; Cavers et al., 2022; Saab et al., 2021; Soto et al., 2022; Williams et al., 2021). As seen throughout the literature, education can improve lung cancer screening knowledge. Unfortunately, gaps still exist. This project was not only developed based on gaps within the literature, but based on specific needs and gaps within the projects' clinic setting. According to the organization's lung cancer screening coordinator, the lung cancer screening program speaks with every patient prior to screening to determine if they are eligible and what to expect. However, eligible patients in this specific clinic get a chest CT scan based on oncology surveillance guidelines and are not met with prior to scan, as these chest CT scans are not specifically ordered as low dose lung cancer screenings. As a result, patients are lacking education on lung cancer screening. This is important as when they graduate from the survivorship clinic, they may or may not receive lung cancer screening due to lack of knowledge and awareness. Therefore, this DNP project evaluated the impact of a one-on-one in person educational intervention for cancer survivors on their lung cancer screening knowledge and screening rates.

# Methods

## Design

This quality improvement project used a quasi-experimental one group pre-test, post-test design. The researcher utilized non-probability convenience sampling to evaluate the effect of an educational intervention on lung cancer screening knowledge, screening referrals, and screening rates. A pre-chart review determined which patients were eligible to receive the intervention. Subsequently, a retrospective chart review examined rates of screening and chest CT scan results.

## Setting

### *Agency Description*

The setting for this project was a single outpatient oncology clinic in Lexington, Kentucky. The clinic is a part of a larger organization that is recognized as the only National Cancer Institute designated center in the state, ranking as the number one cancer program in Kentucky and 44$^{th}$ nationally (UK HealthCare, 2022; US News & World Report, 2024). According to the center's report, there were 136,213 total outpatient visits in 2022. Providers in the clinic deliver care to both those undergoing treatment and cancer survivors. Cancer survivors attend survivorship appointments, which provide transition from active cancer treatments (UK HealthCare, 2018). At survivorship appointments, providers develop individualized plans to coordinate care and educate on needed cancer screenings and immunizations (UK HealthCare, 2018).

### *Congruence of Project to Agency's Mission/Goals/Strategic Plan*

As this oncology center is committed to improving Kentuckians' lives and providing the best care for patients, education and referral for lung cancer screening is important. The center's

goal is “to reduce cancer burden with a focus on Kentucky, and its most vulnerable populations through research, prevention, treatment, education, and community engagement” (UK HealthCare, 2022, p. 2).

### *Description of Stakeholders*

Several key stakeholders were involved in this project. Key stakeholders included patients and their families, project committee members, the clinic nurse manager, a clinic nurse practitioner and mentor, and UK HealthCare. Patients and their families determined willingness to participate in the project. Project committee members, the clinic nurse manager, and the APRN were supportive and worked to facilitate the project. Finally, UK HealthCare is affected by education and lung cancer screening referrals.

### *Site-Specific Facilitators and Barriers to Implementation*

Site-specific facilitators included working with a supportive nurse practitioner and mentor, approval from the clinic manager, appropriate space and time to facilitate the project, access to EPIC, and alignment with the organization’s goals. Site-specific barriers included lack of patients to fit criteria, appointment no-shows or reschedules, and patients already knowing about or receiving lung cancer screening.

## Sample

The study population consisted of cancer survivors who were attending their survivorship appointment between September 28, 2023 and January 25, 2024. During the pre-intervention chart review, 64 charts were analyzed to identify eligible participants. Exclusion criteria included those with an active cancer diagnosis, lung cancer survivors, those not meeting the USPSTF criteria, and those not able to read and write in English. Inclusion criteria included cancer survivorship patients whose provider was the clinic APRN, all genders, races, and ethnicities

able to read and write in English, and meeting the USPSTF criteria for lung cancer screening. Therefore, 13 patients were deemed eligible. Based on appointment no show or reschedule, eight patients were included in this project.

## Procedure

### *IRB Approval*

Approval was obtained from the University of Kentucky Office of Research Integrity and Institutional Review Board before project implementation. The initial project proposal was submitted on August 29, 2023 and after revision, received final approval on September 15, 2023. A modification for data collection on chest CT scan results occurred on January 11, 2024 and was approved on January 12, 2024.

### *Description of Evidence-Based Intervention*

To determine project eligibility, a pre-chart review was performed. The pre-chart review took place in the oncology clinic. Obtaining consent prior to the pre-chart review was not feasible for the project design and would have been difficult due to the number of charts reviewed. Pre-chart review information was stored in an encrypted spreadsheet, on a password protected computer to which only the PI had access.

Project recruitment also occurred at the clinic. A list of eligible patients was reviewed with the APRN who was overseeing care. During each survivorship appointment, eligible patients were invited to participate in the project. If the patient agreed, the PI reviewed the project, answered any questions, and obtained IRB stamped informed consent. Project participants were given a copy of their signed consent and the PI kept the original in a secured location, under lock and key, only accessible to the PI. All participants who were asked agreed to

participate in the project; however, if they had declined, pre-chart review data was destroyed according to UK Policy A13-050.

After the patient consented to project participation, they were provided with a pre-survey (see Appendix A). The participant was then left alone in the clinic room to fill out the survey. Post survey completion, participants underwent the individual patient educational session. The educational intervention, guided by an evidence based trifold decision aid created by the PI (see Appendix B), lasted less than five minutes and included lung cancer statistics in Kentucky, eligibility criteria, a description of lung cancer screening, and information about the impact of lung cancer screening. Survey data by the American Lung Association (2022a) were also discussed, which found that approximately 70% of patients were unaware of lung cancer screening. As a result, 14.2 million Americans met the criteria for lung cancer screening in 2022; however, it was estimated that only 5.8% were screened (American Lung Association, 2022b). The participant was provided with the decision aid to take home for future reference. Following the evidence-based intervention, patients completed a post-survey (see Appendix C). Pre-survey and post-survey statements were identical. The post-survey data were compared to the pre-survey selections to determine if the education made an impact.

Subsequently, a post chart review analyzed rates of screening, chest CT scan results, and follow up data. If a CT was abnormal, follow up data included additional testing and/or referrals.

### *Measures and Instruments*

The outcome measures for this project were evaluating lung cancer screening knowledge, willingness to be screened, referral rates, screening rates, and screening results before and after an educational intervention. Pre-survey and post-survey data were utilized to determine change in these measures. A few surveys exist that examine lung cancer screening knowledge, attitudes,

and beliefs; however, not one valid and reliable instrument exists that is standardized across languages and healthcare settings. Therefore, a survey was created for this project after the literature review and consultation with providers (Bouchard et al., 2022; Crothers et al., 2016; Monu et al., 2020; Sakoda et al., 2020; Soto et al., 2022; see Appendix A and C). The paper survey consisted of five Likert scale questions and two open ended questions. The Likert scale responses included agree, somewhat agree, neutral, somewhat disagree, and disagree.

***Data Collection***

Many data points were collected for the purpose of this project. Pre-intervention chart review information gathered and documented before obtaining informed consent included name, date and time of appointment, age, smoking status, quit date if applicable, and pack years. All other pertinent data were collected after informed consent was signed.

Surveys were an important aspect of this project, as responses determined the impact of the lung cancer screening educational intervention. The original paper pre- and post-survey documents were kept in a secure location, under lock and key. Additionally, a master list of pre- and post-survey responses was stored in a secure, encrypted Excel spreadsheet, on a password protected computer to which only the PI had access.

After survey and intervention were complete, additional demographic data were obtained from the pre-existing electronic medical record, EPIC. The following personal health information (PHI) collected for each patient included: age, gender, race, ethnicity, marital status, insurance status, county of residence, cancer diagnosis, length of remission, and prior lung cancer screen (see Table 1). A separate secure, encrypted Excel spreadsheet on a password protected computer stored the participant demographic information. This allowed the PI to track eligible participants and the total number participating in the project. For post-chart review

purposes, data had a patient identifier throughout the project. The patient identifier allowed the PI to determine referrals, screening rates, and chest CT scan results. If a CT was abnormal, the retrospective chart review analyzed follow up data including additional testing and/or referrals.

Data were only used for the purpose of this project and deidentified before reporting to maintain participant confidentiality. All data will be retained for 6 years after the study, then destroyed according to UK Policy A13-050.

### *Data Analysis*

The PI utilized IBM SPSS version 29 to conduct data analysis. Specific statistical tests, determined by level of data and study design, were used. For this project, the difference in pre- and post-intervention survey responses was analyzed using the paired t-test. A descriptive analysis of participant demographics was included, measuring frequencies and percentages for categorical variables and means and standard deviations (SD) for continuous variables.

## Results

### Demographics

Sixty-four patient charts were reviewed to determine project eligibility. A majority of patients had current or former tobacco use history but 21 had no history of tobacco use. Of those with a former tobacco use history, only 13 patients quit less than 15 years ago. Other patients were excluded from the project due to their lung cancer history or active cancer diagnosis (see Figure 1). Based on inclusion criteria, 13 patients were eligible for this project. Of those patients, five did not show up for their appointment or rescheduled their appointment to a day when the PI was not able to be in clinic. Therefore, only eight patients participated in this project. The response rate was 61.5%.

The mean age of participants was 60.4 (*SD*=6.1; see Table 1). Most were currently using tobacco products (62.5%). Of those with a former history of tobacco use, one quit six months ago (12.5%), whereas the other two participants quit 10 years ago (25.0%). Overall, the mean pack years was 54.5 (*SD*=29.1). Diagnoses included pancreatic, renal, bile duct/liver, appendiceal, colorectal, and head and neck cancers with length of remission ranging from 1 to 10 years.

**Findings**

The paired-samples t-test evaluated the impact of the educational intervention on cancer survivorship participants' knowledge and attitudes regarding lung cancer screening. There was an increase in all mean values from pre-survey to post-survey results; however, the increase was statistically significant for only one statement (see Table 2). The mean score for "I know something about lung cancer screening" significantly increased from 3.5 (*SD*=1.41) before intervention to 4.9 (*SD*=0.35) after intervention, *p*=.028. Only two patients completed the open-ended questions on the surveys. As for the question "What do you know about lung cancer screening?" one participant stated "none" on the pre-survey and "smoking is bad" on the post-survey. Additionally, another participant completed the question "What holds you back from being referred?" on the pre-survey with the statement of "I just had a CT with contrast."

A retrospective chart review could not evaluate the effect of the educational intervention on lung cancer screening referrals and screening rates post intervention as all participants received a chest CT scan prior to the intervention per post-treatment surveillance guidelines. However, a retrospective chart review analyzed the results from these scans. Half of the participants had no pulmonary nodules noted on their chest CT scan, two had stable or unchanged pulmonary nodules, one had a new pulmonary nodule, and one had two pulmonary

nodules that increased in size from the previous chest CT scan. The participant whose pulmonary nodule had increased in size was referred to interventional radiology for a percutaneous lung biopsy. The biopsy result report stated differentials included a muconodular papillary tumor and undersampled low grade adenocarcinoma. Excision of the lesion was recommended for definitive diagnosis. This abnormal chest CT scan and biopsy result data signifies the impact of yearly lung cancer screenings.

## Discussion

An educational intervention with a concurrent decision aid can be an effective way to improve lung cancer screening knowledge. Overall, pre-intervention scores revealed that most participants had heard of lung cancer screening and knew they were eligible, but were lacking knowledge on lung cancer screening. After the education session, there was an increase in knowledge scores, as all patients agreed to knowing something about lung cancer screening. This project demonstrated the importance of patient education and shared decision making regarding preventative screenings.

A retrospective chart review examined the results of participants' chest CT scans. One hundred percent of patients in this project received a chest CT scan as recommended by oncology surveillance guidelines. Even though chest CT scans occurred before intervention, results indicated the importance of lung cancer screening for asymptomatic, high-risk individuals. Though a screening might determine that no pulmonary nodules exist, it can also reveal new nodules or monitor for changes in existing nodules. Advocating for yearly screening as recommended is important to detect for any changes and refer early to appropriate services.

Previous studies have examined the impact of education on lung cancer screening knowledge. Overall knowledge improvement was consistent across studies (Bouchard et al.,

2022; Housten et al., 2018; Reuland et al., 2018; Saab et al., 2021; Sakoda et al., 2020; Williams et al., 2021). These results coincided with a statistically significant increase in knowledge scores from this project. This project found that even though participants lacked knowledge before intervention, they were still interested in and willing to undergo screening. Similar results were found in two other studies (Sakoda et al., 2020; Soto et al., 2022). After intervention, interest and willingness increased, as attitudes changed regarding screening. On the contrary, Reuland et al. (2018) found that knowledge and screening preference were inversely related, indicating the more knowledge one had about screening the less likely they preferred to undergo screening. Reuland et al. (2018) determined the need for additional research to understand the cause of this inverse relation as there was no difference in screening behaviors; however, the author speculated this inverse relation could be related to overestimating screening benefits at baseline and the subsequent more realistic understanding post-intervention.

Although several studies measured intent (Bouchard et al., 2022; Sakoda et al., 2020; Williams et al., 2021), only Reuland et al. (2018) evaluated lung cancer screening referrals and screening rates. Like Reuland et al. (2018), this project found screening was beneficial for at-risk individuals. To our knowledge, this project has been the only one to assess a one on one in-person educational session with cancer survivors and subsequently evaluate screening results. Even though one would expect cancer survivorship patients to be aware of lung cancer screening, this was not the case.

One quality improvement measure for this clinic is lung cancer screening. The clinic uses this quality metric to detect early lung cancers, which would allow for more treatment options and greater chance for full recovery. Thus, meeting this measure has important cost implications for the clinic and health system alike.

This project had a number of strengths. Overall, this project showed that an educational intervention may be needed for lung cancer screening, as lung cancer screening knowledge improved after education. Although education alone can improve knowledge and willingness to be referred, a concurrent decision aid provided visual representation for both intervention and future use. Participants were receptive to education and were willing to partake in the intervention. As patients want to be educated on preventative lifesaving screenings, providers must establish time within their already busy appointment to implement teaching. Providers must not only make time but understand all aspects of lung cancer screening to provide patients with the necessary education. The APRN in this oncology clinic is knowledgeable about screenings and has an effective system in place to discuss preventative services with patients; therefore, the continuation of preventative lung cancer screening discussions will be easily sustainable at survivorship appointments. The APRN can provide eligible patients with an associated decision aid and include a phrase regarding lung cancer screening at the end of eligible patients' office visit notes or in the after visit summary paperwork. To monitor sustainability, the clinic can perform regular audits to determine performance metrics. In settings where patients do not frequently get chest CT scans, education and use of a decision aid could be an effective way to increase referrals and screening rates.

## Implications for Practice, Education, Research, and Policy

The findings in this project have important implications for practice and future research to promote preventative screenings and subsequently reduce the risk of late-stage lung cancer diagnoses. It is essential that a complete tobacco use history is documented and up to date in every patient chart at each healthcare encounter, as pack years and smoking status are two criteria for lung cancer screening. Without a current, accurate tobacco use history those meeting

criteria could be at risk of not being identified as high risk and referred for lung cancer screening. Providers must not only have an accurate tobacco use history but be knowledgeable about lung cancer screening eligibility and its risks and benefits.

Although research has shown that education increases lung cancer screening knowledge, the greatest barrier to implementing it is time. McDonnell et al. (2018) found that shared decision making only took about 5 to 10 minutes and was helpful for patients in deciding whether to initiate lung cancer screening. If providers possess lung cancer screening knowledge, shared decision making is easily attainable during patient encounters. To expedite this, providers should consider implementing a decision aid to improve discussion. As McDonnell et al. (2018) discovered, most patients sought to be screened after viewing a decision aid alone, even before talking with their provider. Future research is needed to determine how education can make the greatest impact.

This project not only reinforced education's impact on knowledge and screening rates with cancer survivorship patients but determined the need for further improvement efforts. To ensure that eligible patients get a preventative lung cancer screening, organizations must develop a succinct protocol or tool to document tobacco use. History should contain all pertinent information including smoking status, start date, pack years, and quit date, if applicable. Having tobacco use history is imperative; however, if providers are unaware of lung cancer screening and its criteria, it may seem useless. Therefore, future improvement efforts must not only consider educating patients but providers alike. A lung cancer screening educational intervention can be implemented in any setting, including oncology clinics and primary care offices. Future recommendations for lung cancer screening education include one-on-one in person sessions, as seen in this project, telephone education, education incorporated into patients' after visit

summaries (AVS) or office notes, decision aids located in office waiting rooms or individual patient rooms, and MyChart messages. Finally, implementing this educational intervention before patients have completed their CT scan would be beneficial in determining impact on screening referrals and screening rates. As recommendations are changing, education will be key to improving knowledge and screening referrals.

There has been a recent change in the literature about recommendations for lung cancer screening eligibility. In late 2023, The American Cancer Society (ACS) updated their lung cancer screening guidelines. ACS recommends removing the number of years post-quitting as a criterion for screening, as there was no real evidence or rationale in past guidelines for years since quitting (YSQ) (Wolf et al., 2024). Former smokers are still at high risk for lung cancer regardless of quit date. As a result, ACS eligibility criteria are those 50 to 80 years old with a 20-pack year smoking history and currently or formerly smoked (Wolf et al., 2024). Removing the number of years since quitting would allow for more patients to be eligible for screening. Provided the change in criteria, at least two patients plus a potential nine more via pre-chart review data would be eligible for screening. These nine patients did not have pack year data in their chart; therefore, it is unclear if they were truly eligible. As of now, the USPSTF has not changed their eligibility criterion.

The recent change in lung cancer screening eligibility guidelines could have important implications for policy and its development. This would not be the first time lung cancer screening has appeared within politics in Kentucky. In 2022, Kentucky House Bill 219, an ACT relating to lung cancer screening, was signed into law. House Bill 219 provides Kentuckians with a lung cancer screening program, funding, and an advisory committee (Kentucky General Assembly, 2022). The goal of this lung cancer screening program is to increase screening rates,

reduce morbidity and mortality, and decrease the cost of treating lung cancer (Kentucky General Assembly, 2022). Lung cancer screenings are not only prominent in policy, but have become well recognized by Centers for Medicare & Medicaid Services and insurance companies. Future efforts in policy for lung cancers screening should involve the coverage of those exposed to secondhand smoke, those who use e-cigarettes or vaping devices, and those whose quit date was greater than 15 years ago.

## Limitations

This project did have some limitations. The sample size was small (*N*=8) and consisted of only Caucasian, non-Hispanic cancer survivorship patients in a single clinic in Kentucky. Therefore, the degree of generalizability to other patients and settings is unclear. As these cancer survivorship patients were already receiving chest CT scans prior to intervention, the impact of the educational intervention on referrals and screening rates could not be measured. For several patients, tobacco use history was incomplete, inaccurate, or not up to date, limiting potential study participants. Providers need to ensure that this information is updated at every encounter, as this impacts screening eligibility. Lastly, although research exists for lung cancer screening education, there is not one validated, reliable tool to measure knowledge and attitudes. For this study, a survey tool was created based on the current literature and provider consultation. Despite limitations, this project provided valuable insight regarding education's impact on lung cancer screening.

## Conclusion

Lung cancer causes considerable burden, not only in Kentucky but throughout the country, as it is the leading cause of cancer death. When diagnosed early, survival is much greater; however, approximately half of lung cancer diagnoses occur too late. Yearly lung cancer

screening can combat these late-stage diagnoses. Although lung cancer screening is vital for early detection, barriers exist, including lack of awareness that screening is available and important. One way to overcome this lack of knowledge and awareness is through education guided by the health belief model, as seen in this project. Education can not only improve knowledge, but interest and willingness to be referred for screening. Providers must ensure shared decision-making regarding lung cancer screening occurs at patient encounters. Even though this project evaluated lung cancer screening knowledge in cancer survivorship patients, educational interventions can be utilized in any healthcare setting. Patient acceptance of screening may not be the issue, but the lack of time providers spend educating on lung cancer screening. Education is key to improving knowledge and screening rates in our high-risk patients. By spending just a few minutes educating patients about this preventative screen, appropriate referrals can be made and lives saved.

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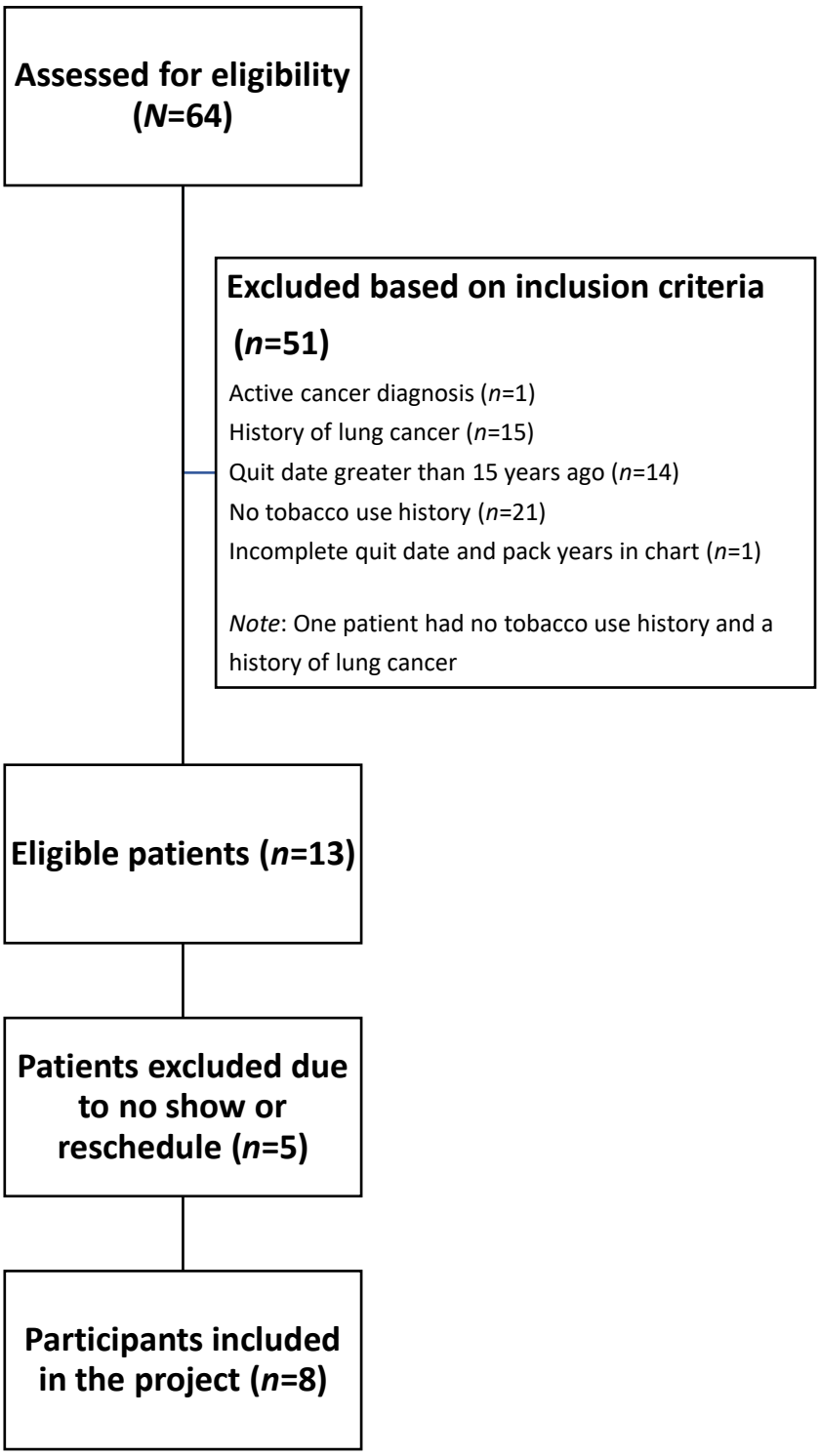
*Table 1*. Summary of demographic characteristics of participants, (*N*=8)

| **Variable** | **Mean (SD), Frequency (%)** |
|---|---|
| Age | 60.4 (6.1) |
| Gender | |
| Male | 4 (50.0%) |
| Female | 4 (50.0%) |
| Race/Ethnicity | |
| White, Non-Hispanic | 8 (100%) |
| Marital Status | |
| Married | 4 (50.0%) |
| Divorced | 3 (37.5%) |
| Widowed | 1 (12.5%) |
| Insurance Status | |
| Medicare | 6 (75.0%) |
| Private | 2 (25.0%) |
| Cancer Diagnosis | |
| Pancreatic | 1 (12.5%) |
| Renal | 1 (12.5%) |
| Bile Duct/Liver | 1 (12.5%) |
| Appendiceal | 1 (12.5%) |
| Colorectal | 1 (12.5%) |
| Head and Neck | 3 (37.5%) |
| Length of Remission | |
| 1 year | 1 (12.5%) |
| 5 years | 1 (12.5%) |
| 7 years | 1 (12.5%) |
| 9 years | 1 (12.5%) |
| 10 years | 4 (50.0%) |
| Smoking Status | |
| Former | 3 (37.5%) |
| Current | 5 (62.5%) |
| Quit Date (*n*=3) | |
| 6 months ago | 1 (12.5%) |
| 10 years ago | 2 (25.0%) |
| Pack Years | 54.5 (29.1) |

*Table 2*. Differences in measures of scores before and after intervention, (*N*=8)

| | **Pre Survey** | **Post Survey** | ***p*** |
|---|---|---|---|
| | ***M (SD)*** | ***M (SD)*** | |
| I have heard of lung cancer screening | 4.1 (0.99) | 4.8 (0.71) | .095 |
| I am eligible for lung cancer screening | 4.3 (1.03) | 4.9 (0.35) | .095 |
| I know something about lung cancer screening | 3.5 (1.41) | 4.9 (0.35) | .028 |
| I am interested in lung cancer screening | 4.5 (0.54) | 4.6 (0.74) | .598 |
| I am willing to be referred for lung cancer screening | 4.6 (0.52) | 4.8 (0.71) | .598 |

*Figure 1*. Consort diagram for pre-chart review data



**Appendix A**

**Pre-Survey**

**I have heard of lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I am eligible for lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I know something about lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**If you agree or somewhat agree, what do you know about lung cancer screening?**

---

**I am interested in lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I am willing to be referred for lung cancer screening.**

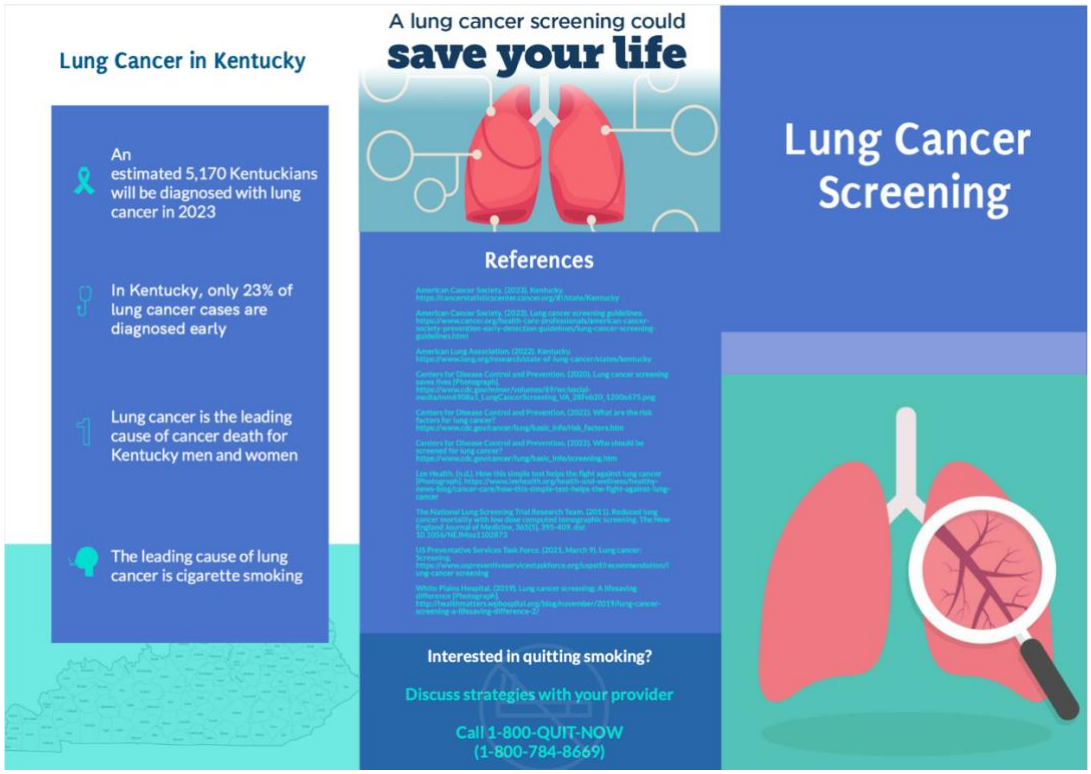
| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

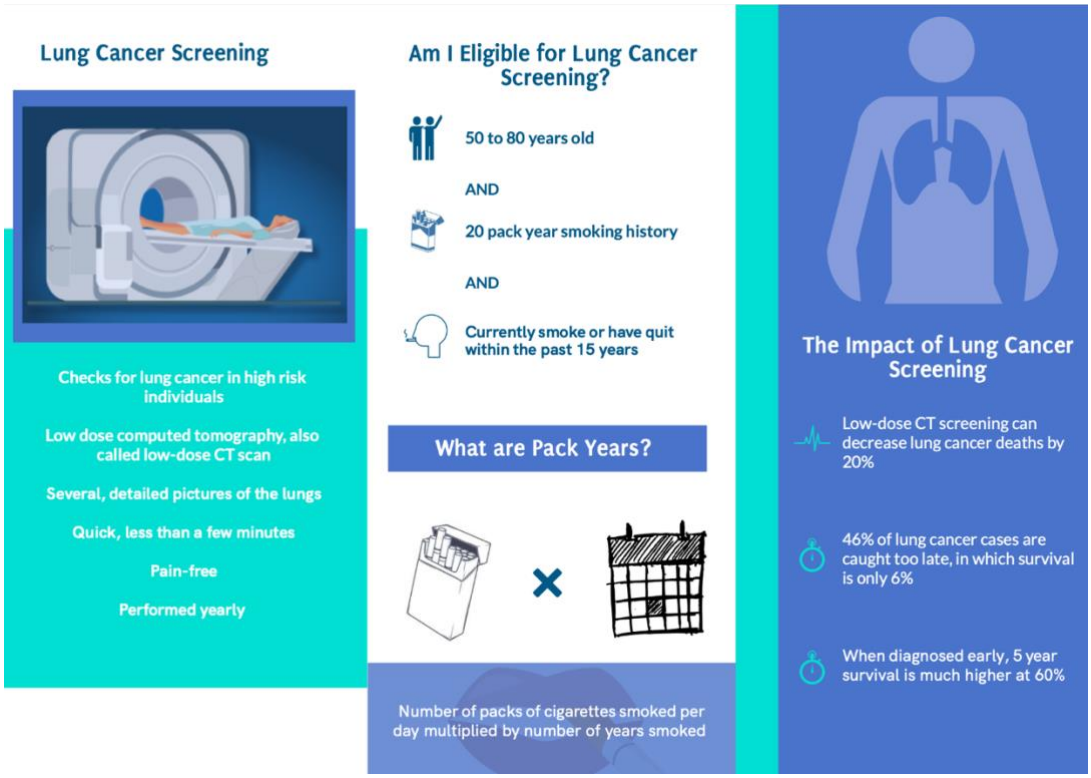
**If you answer neutral or disagree, what holds you back from being referred?**

---

## Appendix B

## Trifold decision aid



**Appendix C**

**Post-Survey**

**I have heard of lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I am eligible for lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I know something about lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**If you agree or somewhat agree, what do you know about lung cancer screening?**

---

**I am interested in lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**I am willing to be referred for lung cancer screening.**

| • | • | • | • | • |
|---|---|---|---|---|
| Agree | Somewhat Agree | Neutral | Somewhat Disagree | Disagree |

**If you answer neutral or disagree, what holds you back from being referred?**

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