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Improving Smoking History Screening and Documentation to Increase Lung Cancer Screenings
in Primary Care Clinics

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing Practice
at the University of Kentucky

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Abstract

BACKGROUND: In the United States, lung cancer has the highest mortality rate of all other cancers among men and women. Kentucky is ranked 50th among all states, leading the nation in new lung cancer cases each year. Lung cancer screening using Low dose Computed Tomography (LDCT) can reduce lung cancer-related morbidity and mortality. Lack of smoking history documentation to identify eligible patients is a major contributing factor to low national screening rates. Obtaining complete smoking history remains the most important technique in identifying candidates for lung cancer screening.

PURPOSE: The purpose of this quality improvement project was to evaluate the rates of complete smoking history documentation and LDCT orders in one primary care setting after implementing evidence-based interventions to improve documentation and screening rates.

METHODS: This quality improvement project followed a quasi-experimental design. Using the FOCUS-PDSA as the improvement model, baseline data for complete smoking history documentation and LDCT orders were analyzed, and a target goal was set. A total of three rapid cycles of change using evidence-based improvement strategies (patient information poster in exam room, staff education, and clinical reminder cards) were implemented and evaluated to assess changes in the amount of smoking history documentation recorded and lung cancer screening orders after each cycle.

RESULTS: Smoking history documentation throughout the study improved significantly ($p = .039$). Documentation was significantly higher after the final cycle (PDSA cycle 3) compared to both cycle 1 ($p=.022$) and cycle 2 ($p=.010$) There was no significant difference in LDCT orders over the three cycles ($p=0.248$). There was minimal improvement overall when evaluating accurate documentation with ordering LDCT ($p=0.30$).

CONCLUSION: Through the combination of interventions used, there was a significant increase in smoking history documentation throughout the study. No specific intervention used was found to have a significant improvement independently. LDCT orders were not affected

substantially by the interventions used in combination with each other or individually. The results suggest that the use of clinical reminders had the greatest improvement in LDCT orders overall and had a significant increase in former smokers' lung cancer screening orders within the chosen clinic.

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Dedication

I want to dedicate this project to my late grandparents Randy Snyder and Betty Jo Baker. My grandfather passed away from lung cancer before adequate screening was available. My grandmother passed away with cancer in December 2021 before seeing me graduate. My grandmother never missed an opportunity to tell me how I am living out her dream of being a nurse. I hope I can continue to make you both proud as a family nurse practitioner.

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Problem Description

Lung cancer has the highest mortality rate of any cancer among both men and women (CDC, 2017). The American Cancer Society estimates that there will be 236,740 new cases of lung cancer and 130,180 lung cancer deaths in 2022 (ACS, 2022). Kentucky leads the nation in new lung cancer cases each year (U.S. Cancer Statistics Working Group, 2018). Kentucky has the highest lung cancer rate in the nation. Cigarette smoking is linked to roughly 80 to 90 percent of lung cancer deaths in the United States (CDC, 2018). Kentucky's smoking rate (24%) is ranked significantly higher than the national rate (15%). Among all other states, Kentucky has the second highest smoking rate in the nation, ranking next to last with West Virginia (ALA, 2022). The CDC reported in 2017 that tobacco use remains the leading preventable cause of death nationally and globally.

Early detection with Low dose Computed Tomography (LDCT) can reduce morbidity and mortality by 20% by improving prognosis and increasing treatment options (De Koning, et al., 2020). Lung cancer screening is the key to diagnosing lung cancer early when the disease is most curable, but only 21% of new lung cancer cases in Kentucky are caught at an early stage before the cancer has spread to other organs and treatment options become limited (ACS, 2022). To ensure at-risk patients are identified and screened via LDCT, there must be accurate and complete smoking history documentation so eligibility for LDCT can be determined; however, it is not occurring at the rate it should be. The Healthy People program is a nationally driven program to improve the overall well-being of Americans over the next decade. The national target from Healthy People 2030 is to increase lung cancer screenings to 7.5%, but currently, the national rate of eligible patients being screened is below the target at 5.7% (Healthy People 2030, 2017). Kentucky's screening rate is 13.7%, which is higher than the national rate but is substantially lower than national screening rates for other cancers such as

colorectal cancer at 63%, breast cancer at 50%, and prostate cancer at 35% (ACS, 2020; ALA 2021).

Lung cancer screening has an estimated 1.5% positivity rate nationally. Meaning for every 1,000 people screened, 15 will be diagnosed with lung cancer (Young, Fairchild & Hefner, 2017). In 2020 it was estimated that 8.51 million Americans were eligible for lung cancer screenings (Fedewa et al., 2021). With a national screening rate of 5.7%, only 485,070 estimated eligible Americans would have received their screening, and 7,276 would be diagnosed with lung cancer. Compared to the breast cancer screening rate of 50%, if 50% of eligible patients received their lung cancer screening an estimated 4,255,000 patients would be screened with LDCT and at a 1.5% positivity rate, 63,825 of these patients would be diagnosed with lung cancer. The screening difference between current lung cancer screening rates (5.7%) and breast cancer screening rates (50%) is missing over 3.7 million eligible screenings and 56,549 Americans having lung cancer undiagnosed. This is significant because many individuals that are eligible for screening and could have lung cancer are being missed which leads to late detection and limited treatment options. Even though lung cancer is the second most diagnosed cancer, the mortality rate is higher than breast, prostate, and colon cancer combined (ACS, 2019). Screening rates must improve, the necessary antecedent of improving screening is to improve smoking history collection.

The 2013 lung cancer screening guidelines, created by the United States Preventative Services Task Force (USPSTF), recommended LDCT of the chest for lung cancer screening instead of a conventional chest computerized tomography (CT) (USPSTF, 2013). In comparison to the conventional chest CT, the LDCT dispenses 90% less radiation and is a more cost-effective approach, leading to early detection and improved outcomes (Radiologic Society of North America, 2018). Lung cancer screening has been around since the 1960s, but screening with LDCT has only been in practice since 2015 and just recently gained Medicare coverage.

Medicare coverage for lung cancer screenings is only available in 40 states, including Kentucky. (ALA, 2021). In March 2021, USPSTF updated its lung cancer screening guidelines. The newest recommendations are annual LDCT of the chest for adults 50 to 80 years old who have a 20 pack-year smoking history and are currently smoking or have quit within the last 15 years (USPSTF, 2021). This recommendation replaced the 2013 USPSTF guideline that recommended annual LDCT of the chest for adults aged 55 to 80 years who have a 30 pack-year smoking history and are currently smoking or have quit within the last 15 years. The newest recommendations increased the age range and lowered pack-year eligibility criteria. The expansion of guidelines in 2021 will aid in identifying more eligible candidates that will in turn optimistically increase screening rates and decrease mortality related to lung cancer (USPSTF, 2021).

Despite the USPSTF recommendations, screening rates remain low due to multiple factors identified in the literature. These factors include limited smoking history documentation, poor provider knowledge of screening guidelines, insurance and cost barriers, lack of patient awareness about screening, and low access to screening centers (Caudill, 2019; Coughlin, et al., 2020; Davenport, 2018; Eberth, 2014; Lewis et al., 2015; Modin et al., 2017; Pham et al., 2018; Raz et al., 2018; Rodriguez, 2019; Schiffelbein, et al., 2020; Simmons et al, 2017; Triplette et al., 2018; Wang et al., 2019). Healthy People 2030 has identified a goal to decrease lung cancer mortality by 10% by 2030. The strategy to decrease mortality is to increase screening rates. Strategies incorporate public campaigns to promote awareness and knowledge of screening by using decision-making aids (Hamann et al., 2018; Schiffelbein, et al., 2020; Simmons et al, 2017). The Kentucky state government is committed to reducing lung cancer mortality by being proactive and supporting the availability and quality of screening (Fedewa, et al., 2021). This resulted in the development of the Kentucky LEADS Collaboration. This initiative was created to

reduce the burden of Lung Cancer by increasing Education, Awareness, Detection, and Survivorship (LEADS) to the public (Kentucky LEADS Collaboration, 2021).

Lung cancer screening rates remain low due to multiple factors despite the recommended guidelines for screening. Overcoming the barriers to lung cancer screening is essential to increase screening rates. Identifying eligible patients is the leading modifiable factor to low screening rates largely due to the incomplete documentation of smoking history (Pham et al., 2018). This project will focus on the importance of complete smoking history documentation to increase eligibility for screening, in hopes of increasing LDCT screening rates.

Purpose

The purpose of this quality improvement (QI) project was to evaluate rates of complete smoking history documentation and LDCT orders in a primary care setting after implementing evidence-based interventions to improve documentation and screenings rates.

Objectives

- Identify existing barriers to obtaining complete smoking history documentation.
- Evaluate changes in complete smoking history documentation after implementation of rapid cycles of evidence-based change strategies
- Evaluate changes in LDCT orders after implementation of rapid cycles of evidence-based change strategies.

Theoretical Framework

Change Theory

The theoretical framework applied to this QI project was the Change Theory created by Kurt Lewin in 1947. Lewin proposed that change in behaviors will occur from changes in the forces or energies within the environment (Lewin, 1947). His theory divides the change process into three stages: unfreeze, change, and refreeze. This model offers an approach that can help

identify the need for change, navigate through the change process, and achieve a desired goal or outcome (Bozak, 2003).

The initial step of the framework has been labeled the “unfreeze” stage, which identifies the need for change and prepares for a change to occur. During this step, evidence is needed to support an intervention that will improve patient outcomes. This step is deemed the most difficult due to challenging individuals' normalcy by reconstructing the driving forces behind the intervention. The second step of the framework is labeled the “change” stage, which strengthens the driving forces by implementing initiatives to bring about positive organizational change. The last step of the framework is labeled the “refreezing” stage, where change has occurred, and the next step is to maintain (refreeze) the change in process. This step is maintained through policy, education, or rewards to ensure this change in practice is continued. The three stages of this theory ensure the problem is identified, a process for change is implemented, and change is maintained.

This study utilized the framework to positively impact change in this QI project. First, during the unfreeze stage identify the driving forces behind low lung cancer screening rates. This QI project expanded on the evidence supporting the disparity of lung cancer screening eligibility being affected significantly by inadequate smoking history documentation, as well as identified clinic-specific barriers via survey. During the change stage, strategies were developed to improve adherence to screening and trialing interventions through each PDSA cycle. The refreezing process occurs once recommendations are made to improve assessment and documentation of smoking history and increase lung cancer screening rates.

FOCUS- PDSA

The FOCUS PDSA model consists of two stages that guide the interventions. The first stage is the FOCUS stage, where an action plan is created. The FOCUS portion of this project

is an acronym for: Find a process to improve, Organize a team, Clarify current knowledge, Understand the cause, and Select a process to improve (IHI, 2019).

The second stage is the PDSA stage, in which four steps are utilized to create the cycles which implement change. The PDSA (Plan-Do-Study-Act) has rapid cycles that can change quickly, depending on the results of the previous cycle focusing on change within the area of improvement. The purpose of these rapid cycles of change is to decide whether the proposed change is effective without disrupting the clinic. The first component of the model is “Plan.” During this step plan development for the project occurs. The second component is “Do”. This step entails small cycles of change to implement the plan. The third component is “Study”. During this phase, data of the implemented change is collected from step two (Do) and analyzed. The fourth component is “Act”. Based on the data gathered from step three, modifications are made to refine the change in anticipation of improvement. The PDSA model is repeated multiple times and focuses on areas of improvement from the previous cycles.

Figure 1. FOCUS-PDSA Model

F ind a process to improve	P lan development
O rganize a team	D o small interventions to create change
C larify current knowledge	S tudy the data collected and analyze.
U nderstand the cause	A ct on intervention once integrating modifications
S elect a process to improve	(IHI, 2019).

Review of Literature

The goal of this literature review was to conduct a comprehensive review focusing on barriers to lung cancer screening in eligible adult patients in the primary care setting, as well as strategies to improve screening. PubMed and CINAHL was systematically searched from 2004 through 2021. A review of Pub Med and CINAHL database was preformed using the following combinations of search terms: *lung cancer screening, smoking, tobacco, documentation, barriers, provider knowledge, adherence, compliance, eligibility, gaps*. The literature search

covered a wide range of study types, including randomized controlled trials (RCTs), case-control studies, interrupted time series, cohort studies, and cross-sectional studies and qualitative studies. It included studies that were conducted in the United States and internationally, including those conducted in developing countries. The search was limited to articles written about adults aged 18 or older and written in English. Studies published in English with free full text available were also used. Exclusion criteria were studies in a language other than English, and studies in the pediatric or adolescent population.

Synthesis of Evidence

Empirical evidence supports screening for lung cancer using LDCT as an effective way to reduce preventable mortality in individuals with a significant smoking history. Screening rates remain low, and the literature provides many factors that lead to this. The literature identified the three commonalities for low lung cancer screenings as inadequate smoking history documentation (Caudill, 2019; Davenport, 2018; Modin et al., 2017; Triplette et al., 2018), provider knowledge on screening guidelines (Couglin, et al., 2020; Raz et al., 2018; Simmons et al., 2017), and lack of patient knowledge of screening (Couglin, et al., 2020; Eberth, 2014; Lewis et al., 2015; Schiffelbein, et al., 2020; Simmons et al, 2017). Identifying an eligible screening candidate begins with recognizing their smoking status and pack-year history. In assessing smoking status, using comprehensive language is important to ensure former smokers are accounted for during screening (Raz et al., 2014).

The gap in provider knowledge of up-to-date guidelines and eligibility criteria contributes to lower utilization of lung cancer screening (Couglin, et al., 2020; Raz et al., 2018; Simmons et al., 2017). In 2016, a study reported that nearly two-thirds of the primary care providers in South Carolina could not accurately state the current guidelines (Ersek et al., 2016). Besides smoking status, additional critical details are often not assessed which limits eligibility due to patients not meeting minimal pack-year documentation. Other factors include lack of understanding of

screening eligibility, inadequate smoking history documentation, and appointment time constraints which led to limited clinical time to address lung cancer screening eligibility in addition to other current medical issues (Raz et al., 2018; Simmons et al., 2017; Triplette et al., 2018).

Lack of patient knowledge of screening prevents some eligible patients from being screened (Couglin, et al., 2020; Eberth, 2014; Lewis et al., 2015; Schiffelbein, et al., 2020; Simmons et al, 2017). Inadequate awareness of screening could be deemed insignificant by the vulnerable population due to a lack of understanding of their true risk which ultimately leads to poor health outcomes. Increased public awareness with educational materials and signs in outpatient offices can stimulate communication between patients and providers to create shared decision-making on their screening eligibility (Hamann et al., 2018; Schiffelbein, et al., 2020; Simmons et al, 2017).

The lack of complete smoking history documentation has been identified in the literature as the leading factor in low lung cancer screening rates (Caudill, 2019; Davenport, 2018; Modin et al., 2017; Triplette et al., 2018). The issue that arises is insufficient details in the smoking history collection including smoking status, former smokers quit date, amount, and length of tobacco use which is required to calculate pack years. Pack-year documentation is potentially the most important component of an individuals' lung cancer screening eligibility determination (Modin et al, 2016). In a similar study, it was found that complete documentation of tobacco history (including pack-years) increased LDCT orders (Caudill, 2019). The incorporation of inclusive, meaningful language/questions can improve history collection and aid in identifying eligible screening candidates (Raz et al., 2014). Creating a standardized process for smoking history data collection will improve EMR data quality while ensuring all patients are identified when eligible for screening (Modin et al., 2016). Overall, inadequate smoking history

documentation is a modifiable factor that could be improved with adequate resources and education (Triplette et al., 2018).

Improved patient rooming procedures and the use of screening reminders are the leading interventions to combat inadequate smoking history documentation (Coughlin, et al., 2020; Johnson et al., 2017; Polubriaginof, Salmasian, Albert, & Vawdrey, 2018; Modin et al., 2016). Since the initiation of EMRs, smoking status documentation has improved (Chen et al., 2013; McGinnis et al., 2011; Modin et al., 2017). Yet, EMR documentation on smoking history is highly vulnerable to inaccuracies leading to missed opportunities in identifying eligible patients for screening (Modin et al., 2017). Improving rooming procedures to incorporate standardized documentation in the EMR of smoking history would increase documentation rates. This intervention could allow more accurate state and national data collection, in addition to identifying eligible patients for LDCT to reduce mortality from lung cancer.

Summary of Evidence

The studies synthesized for this QI project analyzed barriers affecting the lung cancer screening rate. The findings between studies identified the main barriers to lung cancer screening included inadequate smoking history documentation, poor provider knowledge of screening guidelines, and lack of patient knowledge of screening options and eligibility criteria. Evidence revealed that obtaining a complete smoking history is a key element in determining eligibility and prompting providers to initiate screening orders while educating patients of their eligibility and screening protocol.

Gaps in Knowledge

Lung cancer screening is an essential part of health maintenance. Despite the USPSTF recommendations, the leading factor hindering eligibility is inadequate smoking history documentation. Only 5.7% of the eligible population received lung cancer screenings in 2021, according to the American Cancer Society (ACS, 2021). Documentation compliance is a key

element in identifying eligible patients. Providers represent the key component of screening implementation. Providing the clinic staff with education and the tools to complete smoking history documentation will in hope improve screening rates and implementation.

Methods

Design

The goal of this project was to improve lung cancer screening by improving eligibility recognition through complete smoking history documentation. This QI project followed a quasi-experimental design. The project followed the FOCUS-PDSA model which was used to identify opportunities for improvement and use a planned approach to implement change.

Setting

This project took place in an urban family medicine clinic located in Kentucky that provides primary care services to patients of all ages. The clinic office space was used to conduct this research. This facility is easily accessible from most parts of Lexington, KY, and includes free parking. This clinic offers primary care, prevention, and continuity care for patients.

Congruence of project to selected agency's mission/goals/strategic plan

The University of Kentucky is dedicated to improving people's lives across the Bluegrass through economic development, research, and healthcare. Their mission is to provide quality health care to all in a manner that serves those in need by sharing and applying knowledge. Improved tobacco history screenings will increase the identification of eligible patients for lung cancer screenings and can reduce morbidity and mortality related to lung cancer.

Stakeholders

Multiple stakeholders are involved in the improvement of tobacco history screening including medical assistants (MA), providers, and patients. The medical assistants ensure all patients are screened and that documentation is current and up to date. Providers are responsible for providing care, education, and referrals for eligible patients. The patient must

actively participate in the care to allow for open communication to prevent setbacks from barriers.

Other stakeholders include the University of Kentucky lung cancer screening program staff, insurance companies, and the clinical leadership with the ability to use the EMR to track data and who are held accountable for clinical outcomes. The University of Kentucky provides Kentuckians with the opportunity of early detection and treatment with proper care coordination in the lung cancer screening program. The insurance companies are stakeholders because of the need to ensure the cost of screening is covered by the patient's insurance. The Epic EHR has components that can compute and sense data that can improve the delivery of healthcare.

Barriers and Facilitators Identified

Facilitators at the clinic include the clinic's focus on promoting health screenings and preventing health problems as well as improving the quality of care for all patients. This clinic, as well as all other UK facilities have Epic EHR which allows for access to current care gaps including past due screenings for each patient, as well as the ability for the use of clinical reminders.

Time constraints of patient visits, lack of patient knowledge of screening, lack of smoking history documentation, and providers' unfamiliarity with screening guidelines were all identified in the survey as barriers to effective screening. Barriers to identifying eligible candidates for lung cancer screening included time constraints during patient visits leading to a lack of time to screen effectively, as well as providers not being notified of a positive screening identified during the rooming process in which the MA obtained and documented a complete smoking history.

Sample

Target Population: Clinic staff

Inclusion criteria included medical assistants and providers, aged over 18 years old, that were currently employed at the clinic. Participants could have been of any race, ethnicity, or

gender. The clinic personnel were not included in the prospective chart review. Data was collected from staff via an anonymous survey.

Secondary Target Population: Lung cancer screening eligible patients

Inclusion criteria included all clinic patients 50 – 80 years of age that were current or former smokers, and residents of Kentucky. Participants could be of any race, ethnicity, or gender and have any or no health insurance.

Exclusion criteria included pediatric patients, children, and adults under the age of 50 and over the age of 80, or non-Kentucky residents. There was no direct interaction with patients, only patient charts that met inclusion criteria were reviewed for data collection.

Enrollment

The enrollment date for this research project was November 2021 to January 2022. The retrospective chart review included charts from November 2021 while the prospective review period was from December 2021 to January 2022. The sample population used throughout this study was a convenience sample for the period in which data was collected. The sample during the retrospective baseline chart review was 20 adult patients meeting the following eligibility criteria: 50- to 80-year-olds who have a 20 pack-year smoking history and are currently smoking or have quit within the last 15 years. The prospective chart review was composed of 60 adult patient charts divided between the 3 PDSA cycles (20 charts each cycle). A total of 80 patient charts were reviewed during this QI project. In addition, 10 clinic staff members were included in this study.

Procedure

Institutional Review Board Approval

Institutional Review Board (IRB) approval was obtained for this expedited study.

Measures and Instruments

The collection of data was completed using a chart audit to quantify pre- and post-measures on smoking history documentation and LDCT orders. The barriers in the clinic were assessed electronically using a survey created by the PI and entered in the Qualtrics. The survey had a total of six questions, including both Likert scale and open-ended questions. The questions ranged from personal perceived barriers, ranking of clinic barriers, the question used when assess smoking history, and improvements they felt would make the most impact on low screening rates. Qualtrics was used to create a survey to allow the survey to be sent and completed electronically to ensure the survey was easily accessible. This anonymous, voluntary survey was distributed via email to clinic staff with a cover letter (Appendix A) and a link to the survey. The survey was used to evaluate the barriers and adherence of staff to screening all eligible patients. Data were analyzed through inferential and descriptive statistics to calculate a measurable outcome.

Description of Evidence-Based Interventions

Stage One: Plan Development

Find a Process to Improve

The focus of this project was improving rates of lung cancer screening using LDCT.

Clarify Current Knowledge

Despite the USPSTF recommendations, screening rates remain low due to multiple factors, with inadequate smoking history documentation being identified as the leading factor. The first step was to clarify the current process for screening for lung cancer within the chosen clinic. The PI completed an in-depth review of the clinic's current practices by personally examining and creating a process map of the clinic's flow (Appendix E). The rooming process, as well as providers' assessment was evaluated to identify the barriers to effectively screening all eligible patients. During the rooming process, the MA obtains vitals, establishes the chief

complaint, and completes the patient's history, including their smoking history. Once the MA is finished, they leave the room and the provider enters to review the patient's chief complaint, perform a physical exam, discuss a treatment plan, and assess necessary gaps in health maintenance. If the provider deems the patient eligible for LDCT screening, they have a shared decision-making conversation with the patient and if willing, LDCT is ordered. In theory, the process is fine, yet the issue is that this process is not always followed.

Understand the Problem

A voluntary survey (Appendix B) was sent to all MAs and providers to explore the barriers that contribute to the low screening rate for lung cancer. The barriers identified guided the processes to improve all cycles (Figure 3). The main factors identified were the need for increasing patient awareness of screening guidelines, improving smoking history documentation, and increasing the clinical staff's knowledge of screening guidelines. This decided the selection of evidence-based strategies to improve the screening rates.

Select a Process to Improve

The process to improve was the improvement in LDCT orders, which relies on complete documentation being completed. A smart goal was created to ensure there was a specific, measurable, attainable, relevant, and time-bound goal.

SMART GOAL: The goal of this quality improvement project was to improve smoking history documentation of screening guidelines to increase lung cancer screening orders by 3% for all eligible patients by the end of January 2022.

Stage Two: Implement Plan

The PDSA model uses rapid cycles of change that helped guide the processes of the following cycles. The processes selected for improvement were to increase patients' awareness of screening guidelines, improve smoking history documentation and knowledge of screening guidelines due to the barriers identified by staff via survey. Providers and MAs at the chosen

clinic helped with implementing the interventions. The MA helped implement complete smoking documentation during the rooming procedure by using a more inclusive question ["Do you smoke or have you ever smoked"] to ensure former smokers were being screened appropriately. The providers implemented lung cancer screening orders on eligible patients.

The first PDSA cycle was to increase patient awareness of the screening tool and criteria eligibility. The intervention chosen was a lung cancer screening poster that discussed the screening guidelines, how to document pack years, and the pros and cons to screening in an understandable language to patients (Appendix C). This cycle did not measure the patient's awareness, yet to assess lung cancer screening rates with anticipation of provoking communication between patients and providers to discuss their screening eligibility. This intervention aimed to assess if there was an improvement of documentation and LDCT by increasing awareness and provoking conversations with staff.

The second PDSA cycle was built upon cycle one by incorporating an educational intervention with clinic staff, in addition to the informational patient poster. Verbal feedback was collected from clinic staff after cycle one, that revealed they thought the poster helped promote patient awareness. However, complete smoking history documentation remained inadequate resulting in low LDCT ordering rates. This cycle focused on improving complete smoking history documentation and increasing awareness of screening eligibility criteria. Pack year documentation quantifies smoking history by indicating a patient's cumulative tobacco consumption. This is measured by the number of packs of cigarettes smoked per day multiplied by the years the patient has smoked. This measurement is an important factor in determining lung cancer risk, as well as part of the guideline criteria. The 2021 USPSTF lung cancer screening guidelines include annual LDCT of the chest for adults 50 – 80 years old, with a 20-pack year history, and either currently smoke or quit in the last 15 years. The use of inclusive language can mitigate the stigma of smoking and can illuminate the full complex smoking

history. Using a more invasive question such as, “Do you smoke or have you ever smoked”, eliminates not accounting for former smokers during screening. The use of more meaningful questions can result in more complete data collection and aid in identifying more eligible patients.

The third PDSA cycle continued to build off the previous two cycles and was not identified initially. The barrier identified was that there was a gap in communication between the MA obtaining a positive smoking history and the provider who assessed the patient. Although documentation of smoking history improved (which identifies patients eligible), the gap identified was that the provider did not always review the smoking history. Modifications were made to increase communication between the MA and the provider related to patients’ smoking history. A cue to action needed to be created to alert the provider to order lung cancer screenings on all eligible patients identified during the rooming process. The flow of the clinic did not have a process to communicate or alert the provider of an eligible screening candidate once the smoking history was obtained. Before this intervention, the MA would write orders on a 16x20 whiteboard outside the exam room to alert the provider of the reason for the visit and the orders needed. LDCT orders were not included on the whiteboard due to unawareness of screening eligibility with smoking history documentation. The intervention that was implemented was the use of a visual clinical reminder to alert the provider that the patient was deemed eligible for lung cancer screening once obtaining a positive smoking history. The MA collected the smoking history during the rooming process and placed a 4x6 inch laminated bright pink card on the exam room door to notify the provider of the patient’s eligibility due to their smoking history (Appendix D). This allowed the provider to be conscious of eligibility which could prompt shared decision-making conversations about screening with the patient. A second educational session was created to provide a reminder of the initial educational session, in addition to how to use the signs on the doors. An in-person presentation was used to educate the MA’s on how to use the

sign. An in-person conversation took place with the providers to make them aware of the sign and how it would be used. All staff not available for the in-person presentation/conversation were sent an email with the educational material.

Data Collection

The data collected was stored on a password-protected Share point site accessed through a HIPPA protected server. The Qualtrics survey to assess clinic-specific barriers was available to clinic staff for 2 weeks. The electronic health record, EPIC, was used to collect data during the chart review. The collection of data was completed using a chart audit which quantifies pre- and post-measures on smoking history documentation and LDCT orders. The quantitative data collected during each cycle included the medical record number (MRN), provider seen, current smoking status, completion of complete smoking history documentation, and LDCT order. All data was collected and recorded in an Excel spreadsheet and was stored on a password-protected Share point site accessed through a HIPPA protected server. All patient identifiers were removed from data collection except MRN. The MRN was collected to ensure that the identified patients were notified of their screening eligibility once the research study was completed.

The clinic's baseline data was collected in November 2021 before any interventions occurred. The first PDSA cycle interval lasted 14 days and the data collection occurred in December 2021. There was a 3-day lapse between each cycle to analyze data and create the next cycle. The second PDSA cycle interval lasted 26 days. The second cycle interval was extended due to the clinic being closed for the holidays, as well as closing one day for extensive COVID cases within the clinic. The collection of data for cycle two occurred in January 2022. There was a 4-day lapse between this cycle to analyze data and create the next cycle. The third PDSA cycle interval lasted 22 days and the data collection occurred in February 2022.

Data Analysis

Qualitative and quantitative data were collected through the survey using both Likert scale questions (quantitative), as well as open-ended questions (qualitative) which were analyzed and synthesized to identify clinic barriers. The data from the survey and reviewed literature is what guided the PDSA cycles. Data from this investigation were analyzed using SPSS statistical software. Data was analyzed through inferential and descriptive statistics to calculate measurable outcomes. The cycles were compared to determine statistically significant results to suggest the effectiveness of each intervention. Accurate smoking history and LDCT orders of each cycle were compared to preintervention data to determine significance.

Feasibility and Sustainability

This project did not require a budget, or commitments from patients for interactions. The educational intervention was completed by the PI during the clinic lunch hour, which was identified by staff as feasible to have the ability to attend. Staff commitment to attend the educational intervention was voluntary, yet practical due to the timing and location of the intervention. The intervention of the clinical reminder for lung cancer screening is a sustainable intervention due to the absence of continuous cost once appropriate reminders were created due to the lamination of the reminder to ensure longevity. The proposed interventions evaluation of sustainability was limited due to time frame restrictions on the project's completion. Sustainability is inherently tied to accountability. Once the process is in place and awareness of screening guidelines are improved, the process should automatically continue due to heightened accountability through data tracking and performance data. Increasing accountability by assigning someone a specific responsibility can ensure the focus of stakeholders are upheld (Newell, P. & S. Bellour, 2002).

Once this project was completed, a meeting with the staff occurred to discuss all aspects of successes, failures, and improvements of interventions. Continuing the educational

intervention with clinic staff would be sustainable due to the simplicity of adaptation and flexibility of the educational material to be presented. Sustainability can be maintained by the continuation of posters within the rooms on lung cancer screening, improved documentation, and the use of clinical reminders already in place. Interventions would need to be evaluated to determine long-term sustainability within the clinic and other health care facilities.

Results

The study included a total of 80 patients who met inclusion criteria, divided as 20 for baseline assessment, 20 for cycle one, 20 for cycle two, and 20 for cycle three. The range of pack years from all patient participants was from 20 – 104 and the median pack-year comparison of all cycles was 30.5 (Table 1).

Table 1. Descriptive summary of patient characteristics ($N = 80$)

	Preintervention ($n = 20$)	PDSA Cycle 1 ($n = 20$)	PDSA Cycle 2 ($n = 20$)	PDSA Cycle 3 ($n = 20$)
Provider, (n=of patients seen%)				
Provider 1	7 (35%)	2 (10%)	-	-
Provider 2	1 (5%)	3 (15%)	1 (5%)	-
Provider 3	2 (10%)	1(5%)	3 (15%)	6 (30%)
Provider 4	2 (10%)	5 (25%)	6 (30%)	3 (15%)
Provider 5	4 (20%)	6 (30%)	5 (25%)	7 (35%)
Provider 6	4 (20%)	3 (15%)	5 (25%)	4 (20%)
Smoking Status				
Current	12 (60%)	13 (65%)	7 (35%)	12 (60%)
Former	8 (40%)	7 (35%)	13 (65%)	8 (40%)
Pack years, median* (range)	26.0 (20-73)	21.0 (20 – 90)	40.5 (20 – 98)	40 (20 – 104)

**Median was reported over the mean due to the right-skewed distribution of pack years.*

Preintervention Results

During the preintervention data collection, the clinic staff were unaware of the study being preformed. A total of six providers were evaluated and a total of 20 patients that met the criteria during the convenience sample period were evaluated. Of the 20 patients identified as

eligible candidates, 12 were current smokers and eight were former smokers. Complete smoking history documentation of the total of 20 patients was 65%. For LDCT orders, only six were collected (30%) of the 20 eligible patients. For current smokers, five LDCT were ordered of 12 eligible patients (42%), while only one LDCT was ordered of the eight eligible patients who were former smokers (12.5%).

PDSA Cycle One

PDSA cycle one revealed a decrease in smoking history documentation, but an increase in LDCT orders placed from pre-intervention data (see Table 2). A total of six providers were evaluated during this cycle. Of the 20 patients identified as eligible candidates, 13 were current smokers and seven were former smokers. Complete smoking history documentation decreased 20% from preintervention to this PDSA cycle (40%; $p=.204$). Although, LDCT orders increased by 5% ($p=.736$). For current smokers, six LDCT were ordered of 13 eligible patients (46%), while only one LDCT was ordered of the seven eligible patients who were former smokers (14%). Of the nine individuals with accurate documentation which met the criteria for LDCT, only six received an order for LCDT (66.7%) (see Table 2).

Table 2. PDSA Cycle One Results

Smoking History Documentation	Pre-intervention		PDSA Cycle 1		P	
	Assessed	Documented	Assessed	Documented		
		N=20	13 (65%)	N=20	8 (40%)	.204
	<u>Current smokers</u> N=12	9 (75%)	<u>Current smokers</u> N=13	6 (78%)	.411	
<u>Former smokers</u> N=8	5 (63%)	<u>Former smokers</u> N=7	2 (29%)	.608		

LDCT Ordered	Pre-intervention		PDSA Cycle 1		P	
	Assessed	Ordered	Assessed	Ordered		
		Total: N=20	6 (30%)	Total: N=20	7 (35%)	.736
	<u>Current smokers</u> N=12	5 (41.6%)	<u>Current smokers</u> N=13	6 (46%)	.821	
<u>Former smokers</u> N=8	1 (12.5%)	<u>Former smokers</u> N=7	1 (14%)	.919		

PDSA Cycle Two

PDSA cycle 2 revealed a decrease in smoking history documentation and no change in overall LDCT orders placed from preintervention data (Table 3). A total of five of the same providers from cycle one was evaluated during cycle two. One of the six providers from cycle one was no longer working at the clinic by cycle two. Of the 20 patients, seven were current smokers and 13 were former smokers. It is important to note this cycle included more former smokers than current smokers. When comparing the bar graph (Figure 2) there was a marked decline in both complete documentation and LDCT orders for eligible patients.

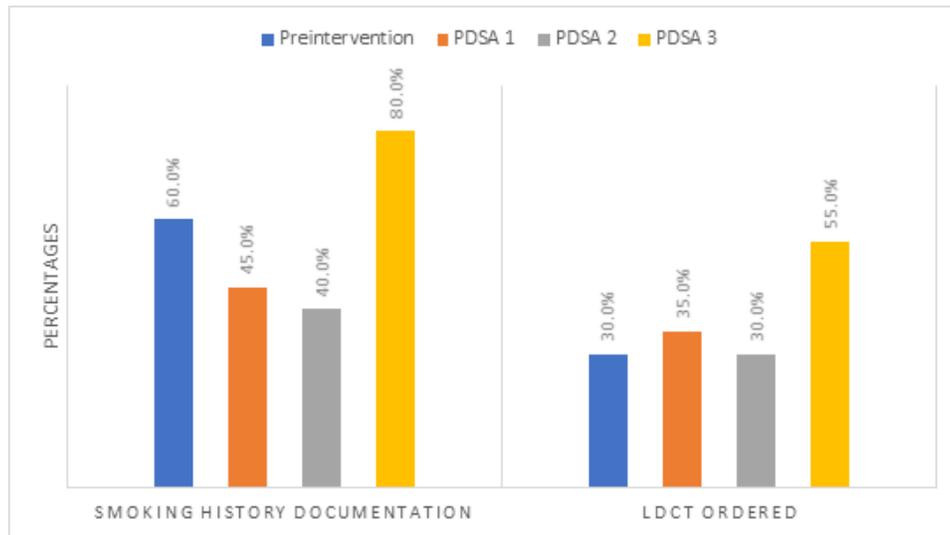
Smoking history documentation decreased from 65% in the preintervention data to 40% in this PDSA cycle ($p=.113$). LDCT orders overall maintained at 30% when compared to preintervention data yet decreased from the PDSA cycle 1 improvement (35%). For current smokers, three LDCT were ordered of seven eligible patients (57%; $p=.960$), while for former smokers only three LDCT were ordered of 13 eligible patients (31%; $p=.549$). Eight total patients had accurate documentation which met the criteria for a LDCT, but only three of the eight identified received an order for LCDT (37.5%)

Table 3. PDSA Cycle Two Results

Smoking History Documentation	Pre-intervention		PDSA Cycle 2		<i>p</i>
	Assessed	Documented	Assessed	Documented	
	N=20	13 (65%)	N=20	8 (40%)	.113
	<u>Current smokers</u> N=12	9 (75%)	<u>Current smokers</u> N=7	4 (57%)	.617
<u>Former smokers</u> N=8	5 (63%)	<u>Former smokers</u> N=13	4 (31%)	.646	

LDCT Ordered	Pre-intervention		PDSA Cycle 2		<i>p</i>
	Assessed	Ordered	Assessed	Ordered	
	N=20	6 (30%)	N=20	6 (30%)	1.0
	<u>Current smokers</u> N=12	5 (41.6%)	<u>Current smokers</u> N=7	3 (57%)	.960
<u>Former smokers</u> N=8	1 (12.5%)	<u>Former smokers</u> N=13	3 (31%)	.549	

Figure 2. Comparison of accurate smoking history documented and LDCT orders.



Note: Documentation significantly higher in cycle 4 compared to both cycle 2 ($p=.022$) and cycle 3 ($p=.010$)

PDSA Cycle Three

PDSA cycle 3 revealed an increase in smoking history documentation and an increase in overall LDCT orders placed from preintervention data. Of the 20 eligible patients, 12 were current smokers and eight were former smokers. Smoking history documentation increased from 65% in the preintervention date to 80% in this PDSA cycle ($p=.288$). LDCT orders overall increased by 20% when compared to preintervention data ($p=.110$). Seven LDCT were ordered for current smokers, out of 12 eligible patients (58%). Five LDCT was ordered for former smokers of the eight eligible patients (62.5%). Of the sixteen patients that had accurate documentation which met the criteria for LDCT, only 12 received an order for LCDT (68.8%) (Table 8). When comparing preintervention data to cycle three, there was a significant improvement in LDCT ordered on former smokers ($p=.039^*$). Of the total of 11 LDCT accounted for during this cycle, two were included that were offered but declined by the patient.

* p value less than .05 is statistically significant

Table 4. PDSA Cycle Three Results

Smoking History Documentation	Pre-intervention		PDSA Cycle 3		<i>p</i>
	Assessed	Documented	Assessed	Documented	
	N=20	13 (65%)	N=20	16 (80%)	.288
	<u>Current smokers</u> N=12	9 (75%)	<u>Current smokers</u> N=12	10 (83%)	1.00
	<u>Former smokers</u> N=8	5 (63%)	<u>Former smokers</u> N=8	6 (75%)	.608

LDCT Ordered	Pre-intervention		PDSA Cycle 3		<i>p</i>
	Assessed	Ordered	Assessed	Ordered	
	N=20	6 (30%)	N=20	12 (60%)	.110
	<u>Current smokers</u> N=12	5 (41.6%)	<u>Current smokers</u> N=12	7 (58%)	.682
	<u>Former smokers</u> N=8	1 (12.5%)	<u>Former smokers</u> N=8	5 (62.5%)	.039*

Summary of Findings

Smoking history documentation throughout the study improved significantly overall ($p = .039^*$) (Table 5). Documentation was significantly higher in PDSA cycle 3 compared to both PDSA cycle 1 ($p=.022^*$) and PDSA cycle 2 ($p=.010^*$; Figure 2). These findings suggest that improved communication between the MA and the providers when smoking history documentation is completed may have been the most effective intervention for implementation in this specific primary care setting. Current smokers throughout all cycles did not have a significant improvement in smoking history documentation ($p = .369$; Table 5). Former smokers did not have a significant improvement although trended towards improvement ($p = .185$; Table 5). Due to increased awareness of smoking risk, it was expected that current smokers would have a greater improvement in LDCT orders.

LDCT orders did not improve significantly over the study ($p= .30$), although this trended towards improvement across cycles (Table 3). Former smokers were found to have a considerable improvement in LDCT orders through the study ($p= .089$) versus current smokers ($p= .979$; Table 6). Of the 80 patients identified in the study, they all met eligibility criteria for

LDCT screening, but only 30 had LDCT ordered (37.5%). The patients with both smoking histories documented and LDCT ordered were not statistically significant ($p=.079$). When breaking down smoking status with accurate documentation and LDCT orders, current smokers had a greater improvement compared to former smokers although not statistically significant ($p=.131$; Table 8). †

Table 5. Accurate smoking history documentation including pack-years

	Total		<i>p</i>	Current Smokers		<i>p</i>	Former Smoker		<i>p</i>
Pre intervention	N=20	13 (65%)	.039*	N=12	9 (75%)	.369	N=8	4 (50%)	.185
PDSA Cycle 1	N=20	9 (45%)		N=13	7 (54%)		N=7	2 (29%)	
PDSA Cycle 2	N=20	8 (40%)		N=7	4 (57%)		N=13	4 (31%)	
PDSA Cycle 3	N=20	16 (80%)		N=12	10 (83%)		N=8	6 (75%)	

Table 6. LDCT Ordered

	Total		<i>P</i>	Current Smokers		<i>P</i>	Former Smoker		<i>p</i>
Pre intervention	N=20	6 (30%)	.30	N=12	5 (41.6%)	.979	N=8	1 (12.5%)	.089
PDSA Cycle 1	N=20	7 (35%)		N=13	6 (46%)		N=7	1 (14%)	
PDSA Cycle 2	N=20	6 (30%)		N=7	3 (43%)		N=13	3 (31%)	
PDSA Cycle 3	N=20	11 (55%)		N=12	7 (55%)		N=8	5 (50%)	

Table 7. Comparison of smoking history documentation and screenings ordered across cycles (N=80)

	Preintervention (<i>n</i> = 20)	PDSA 1 (<i>n</i> = 20)	PDSA 2 (<i>n</i> = 20)	PDSA 3 (<i>n</i> = 20)	<i>p</i>
Smoking history documented					
Yes	13 (65%)	9 (45%)	8 (40%)	16 (80%)	.039
No	7 (35%)	11 (55%)	12 (60%)	4 (20%)	
LDCT orders					
Ordered	6 (30%)	7 (35%)	6 (30%)	11 (55%)	.30
Not ordered	14 (70%)	13 (65%)	14 (70%)	9 (45%)	

* † *p* value less than .05 is statistically significant

Table 8. Comparison of patients who had smoking history documented and eligible for LDCT also had LDCT orders.

	Preintervention (<i>n</i> = 13) ⁺	PDSA 1 (<i>n</i> = 9)	PDSA 2 (<i>n</i> = 8)	PDSA 3 (<i>n</i> = 16)	<i>P</i>
Smoking history documented and LDCT ordered	5 (83.3%)	6 (66.7%)	3 (37.5%)	11 (68.8)	.071
Current	4	5	1	6	.131
Former	1	1	2	5	.459

⁺ N value was gathered from all individuals with complete smoking history documentation that were all deemed eligible for LDCT order.

Discussion

Documentation of complete smoking history is challenging in primary care offices across the nation. Lung cancer screening requires complete smoking history documentation to determine eligibility, which possibly leads to a nationally low screening rate of 5.7%. The literature supports the use of clinical reminders via electronic or physical form to increase documentation and subsequently LDCT orders (Modin et al., 2017). The purpose of this QI project was to evaluate rates of complete smoking history documentation and LDCT orders in the primary care setting after implementing evidence-based interventions to improve documentation and screenings rates. The goal was to improve smoking history documentation and increase lung cancer screening orders by 3% for all eligible patients identified in the clinic. This goal was exceeded, there was a 15% increase in both smoking history documentation (65% to 80%) and LDCT orders (30% to 55%) from preintervention data to final data collection in PDSA cycle 3.

Smoking cigarettes is the number one risk factor for developing lung cancer, it is linked to 80 to 90% of all lung cancer-related deaths (CDC, 2019). Within five years of quitting smoking there is a 39% lower risk of developing lung cancer, and within 10 years of quitting the risk of developing lung cancer is half that of a person who has continued to smoke (ACS, 2019; Mong et al., 2011; Tindle, et al., 2018). However, the risk is still greater than a never smoker so clinicians must be mindful of this risk and eligibility for LDCT. The clinicians need to be alert that

these individuals are at risk and can be missed, and future studies must dive into this issue further. There is very little literature comparing current smokers versus former smokers for lung cancer screening. Yet, identifying eligible patients is the leading modifiable factor to low screening rates which is hindered by the incomplete documentation of smoking history (Pham et al., 2018).

Smoking history documentation in this study had a significant improvement overall, yet no significant improvement in either current or former smokers when assessed exclusively. Due to increased awareness of smoking risk, it was expected that current smokers would have a greater improvement in LDCT orders, although this study found that former smokers had a considerable improvement in LDCT orders. This may have been a unique finding of this study, yet this could be due to identifying more former smokers by using an inclusive question when gathering smoking history.

The results of this study suggest that adequate education and the use of clinical reminders can provide improvement in documentation and screening rates. This is consistent with previous studies showing that the use of clinical reminders cannot only increase documentation but, consequently increase LDCT orders. The use of clinical reminders had considerable improvement in cycle 3 for former smokers, which was a unique finding in this study. Although quitting smoking can lower the risk of being diagnosed with cancer, former smokers are still at higher risk than those who have never smoked. Both current and former smokers must be screened at substantially higher rates. The sole purpose of lung cancer screening is to improve morbidity and mortality outcomes by improving prognosis and increasing treatment options.

Recommendations for Practice

After the implementation of three evidence-based strategies, rates of complete smoking history documentation and LDCT orders improved. It is recommended that a combination of

these interventions be used to improve lung cancer screening in the chosen clinic, as well as other primary care settings. Improved communication between the MA and providers in combination with complete smoking history was the most effective intervention for this study. For this primary care practice, visual cues of clinical reminders were effective. Depending on independent factors in each setting may warrant different types of clinical reminders. Education to the staff on clinical guidelines for screening is important because without adequate knowledge staff will not know who to screen and/or how to document.

Further investigation using a longitudinal study design to analyze pre-and post-implementation of EMR reminders. Incorporating EMR reminders of smoking status with pack-years on the patient's main profile could be effective in provider compliance of LDCT orders. Implementing a standard smart phrase to be used with the Epic EHR could create awareness of the LDCT discussion, with additional information on discussions if the patient declines.

Implication to Research

More PDSA cycles with ongoing interventions could be used to explore the success of further interventions. Future studies could gather data on LDCT completion rates and the barrier to completing, including patient-specific barriers. Patient questionnaires could be used to explore the reason for not completing screening. These barriers could be used to incorporate further PDSA cycles directed towards patient-identified barriers. Incorporating EMR reminders on the patient's main profile could be effective in provider compliance with LDCT orders. Future studies could focus on the effectiveness of implementing EMR reminders for LDCT orders.

Limitations

The sample size for each PDSA cycle was small, which can limit the ability to detect a statistical significance that would be found with a larger sample size. In addition, the fact that documentation of smoking history has not been standardized in this setting creates the potential for inaccurate rates of screening and risk discussions. Currently, the providers and MAs can

document in multiple places including the smoking history tab or within the note. Both places were assessed when auditing charts, but the lack of a standardized location for documentation creates barriers to auditing for screening. If the provider screens the patients and they agree to have a LDCT, an order is placed. Yet, if the provider screens and the patient declines screening, without documentation of the discussion it is assumed it was not addressed. Without standard documentation on screening discussion, it is unclear if screening discussion occurred. Requiring providers to document in a designated area of the EHR could worsen time constraints but incorporating a smart phrase could be more time effective for the provider.

Conclusion

It is estimated that nationally every day in 2022, 648 Americans will be diagnosed with lung cancer and 356 lung cancer-related deaths will occur. Lung cancer screening has an estimated 1.5% positivity rate, meaning for every 1,000 people screened, 15 will be diagnosed with lung cancer (Young, Fairchild & Hefner, 2017). An LDCT scan can reduce lung cancer mortality by 20% by detecting early cancer when treatment is more effective (De Koning, et al., 2020). The number one cause of lung cancer is cigarette smoking and obtaining complete smoking history remains the most important technique in identifying candidates for lung cancer screening. Despite the national target goal for screening of 7.5%, only 5.7% of eligible Americans nationwide were screened in 2021, which remains substantially lower than all-over cancer screening rates. Overcoming the barriers to lung cancer screening is essential to increasing screening rates.

This study focused on evaluating rates of complete smoking history documentation and LDCT orders after implementing interventions to improve documentation and screenings rates. Results of this study suggest that through the combination of interventions used, with collective efforts and attention there was a significant increase in smoking history documentation. Although, individual interventions (poster, educational session, and clinical reminders) did not

have a significant effect on smoking history documentation. LDCT orders were not affected considerably by the interventions used in combination with each other or individually. The results of this project suggest that the use of clinical reminders had the greatest improvement in LDCT orders overall and had a considerable improvement in former smokers' lung cancer screening orders within the chosen clinic. Incomplete documentation of smoking history adds difficulty to identifying eligible patients which is observed to be the leading factor in low screening rates. Ultimately increasing smoking history documentation, can lead to increased LDCT's which can decrease morbidity and mortality of lung cancer.

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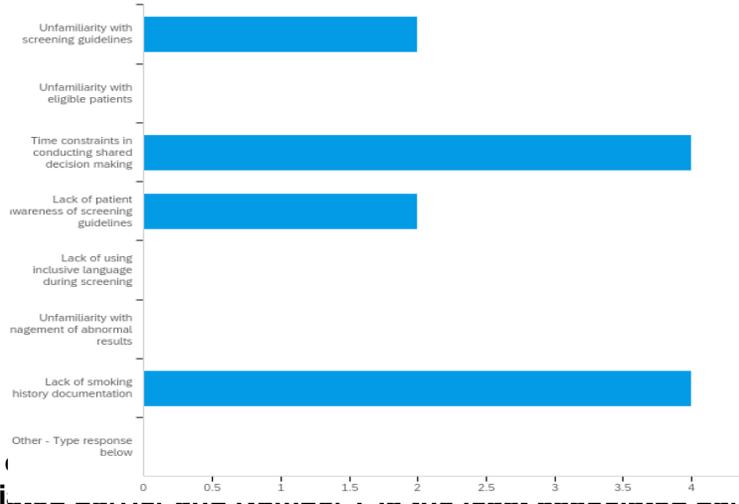
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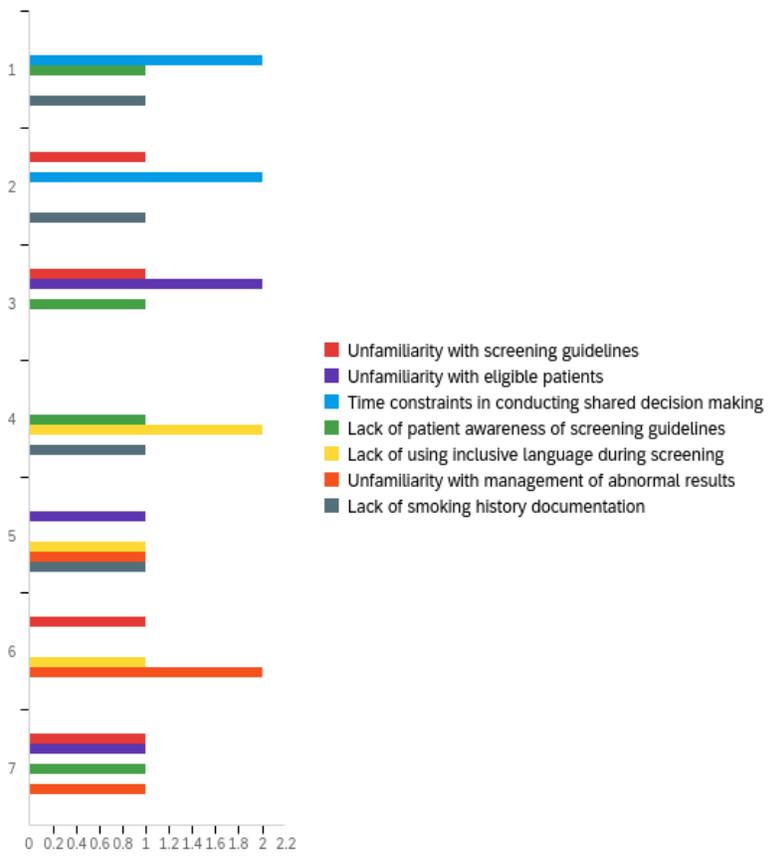
Figures

Figure 3. Survey Findings

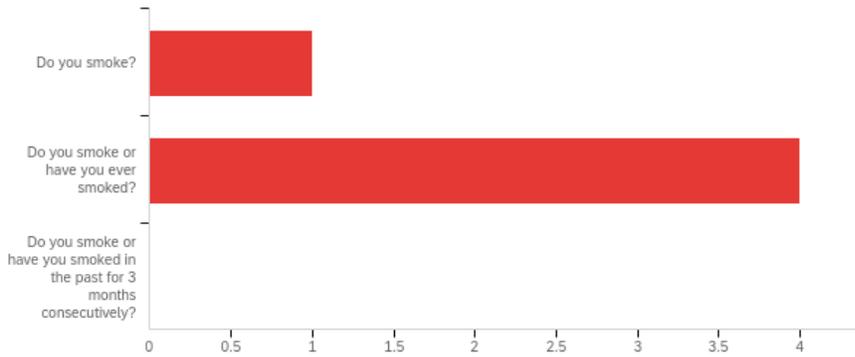
Q1. Select all that apply: Of the following options, which do you associate the barriers to provide lung cancer screening?



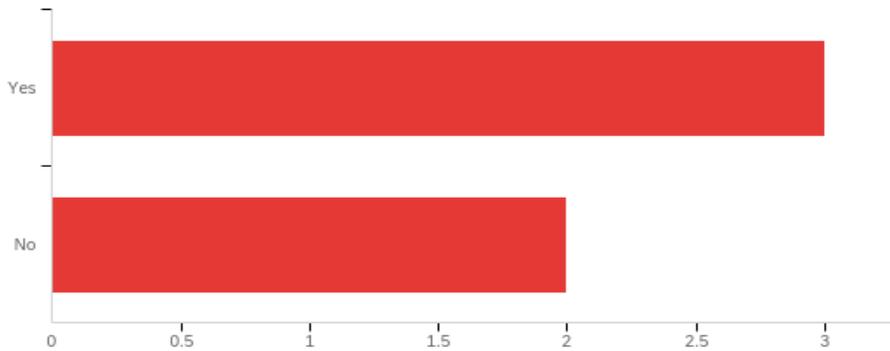
Q2. Rank in order of importance the most associated barrier and number 1 to the least associated barrier of



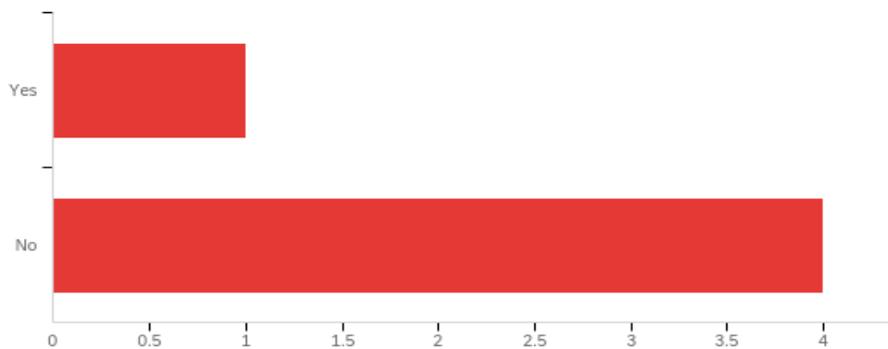
Q3. Of the following options, which question do you use when asking about smoking history?



Q4. When assessing smoking history, do you document pack years?



Q5. Do you look at your Care Gaps during each visit?



Q6. What process or processes within the clinic do you believe could be improved to ensure all eligible patients are screened?

- Preventative health visit only- Must make separate clinic visit for additional chronic issues.
- Adding education flyers in patient rooms
- Using tablets for self-administered screening, or staff administration of screening with a scripted question.

Appendices

Appendix A. Informed Consent

Dear Providers at Polk Dalton,

I am contacting you from the University of Kentucky, on behalf of myself, Destinee Rein to invite you to participate in a research study, "Improving Smoking History Screening and Documentation to Increase Lung Cancer Screenings in Primary Care Clinics." The purpose of this quality improvement project is to investigate the disparity in thorough screening and documentation of current and former smokers. Furthermore, to increase smoking history documentation and low-dose computed tomography (LDCT) orders on eligible patients who meet screening criteria in a primary care setting.

The Principal Investigator is Destinee Rein a faculty member in the Doctor of Nursing Practice Program at the University of Kentucky College of Nursing.

If you agree to participate in the study, you will be asked to complete an online survey on Qualtrics that asks you to provide answers to several question items, in the form of select all that apply, yes/no and fill in the blank. Although you may not get personal benefit from taking part in this research study, your responses may help us understand more about the barrier to screening for lung cancer. Some volunteers experience satisfaction from knowing they have contributed to research that may benefit others in the future. In addition to this survey, an educational intervention will follow educating on the specific objectives of this study. I will be discussing the barriers identified in the clinic to obtaining accurate smoking history documentation, how to combat those barriers and increase compliance on documentation, as well as educating on USPSTF recommendations on lung cancer screening.

If you do not want to be in the study, there are no other choices except not to take part in the study.

The survey/questionnaire will take about 3 minutes to complete. I hope to receive completed questionnaires from about 20 people, so your answers are important to us. Of course, you have a choice about whether to complete the survey/questionnaire, but if you do participate, you are free to skip any questions or discontinue at any time. You will not be penalized in any way for skipping or discontinuing the survey. An educational session will concur with staff meetings each month on the following objectives of the study. A total of 2 educational sessions will concur throughout this project. Each educational session will take a max of 15 minutes to complete.

We make every effort to safeguard your data once received on our servers via Qualtrics. Given the nature of online surveys, as with anything involving the internet, we can never guarantee the confidentiality of data still en route to us. Qualtrics is a secure, web-based application designed exclusively to support data capture for research studies. Your responses will be anonymous. Results of this research will be reported as summarized data and will not contain any identifiable individual data. For this study, you will not be asked to provide a name, email address, or any identifying information.

Should you have any questions you may contact Destinee Rein, the Principal Investigator, at drca229@uky.edu or per telephone at (502) 216-6986. If you have complaints, suggestions, or questions about your rights as a research volunteer, contact the staff in the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at 1-866-400-9428

Please be aware, while we make every effort to safeguard your data once received from the online survey company, given the nature of online surveys, as with anything involving the Internet, we

can never guarantee the confidentiality of the data while still on the survey company's servers, or while en route to either them or us. It is also possible the raw data collected for research purposes will be used for marketing or reporting purposes by the survey/data gathering company after the research is concluded, depending on the company's Terms of Service and Privacy policies. By completing the survey, you are indicating that you are at least 18 years old, have read and understood this consent form, and agree to voluntarily participate in this research study."

Thank you in advance for your assistance with this important project. To ensure your responses/opinions will be included, please submit your completed survey/questionnaire by **December 10, 2021**.

https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_b0YpKVuTOlucCLI

Sincerely,
Destinee Rein
College of Nursing, University of Kentucky

Appendix B. Survey Questions

Assessing Barriers to Smoking History Documentation	
Select all that apply: Of the following options, which do you associate the barriers to providing lung cancer screening?	<ol style="list-style-type: none"> 1. Unfamiliarity with screening guidelines 2. Unfamiliarity with eligible patients 3. Time constraints in conducting shared decision making 4. Lack of patient awareness of screening guidelines 5. Lack of using inclusive language during screening 6. Unfamiliarity with the management of abnormal results 7. Lack of smoking history documentation
Rank in order of associated barriers to providing lung cancer screenings. Number 1 is the most associated barrier and Number 7 is the least associated barrier	<ol style="list-style-type: none"> 1. Unfamiliarity with screening guidelines 2. Unfamiliarity with eligible patients 3. Time constraints in conducting shared decision making 4. Lack of patient awareness of screening guidelines 5. Lack of using inclusive language during screening 6. Unfamiliarity with the management of abnormal results 7. Lack of smoking history documentation
Of the following options, which question do you use when asking about smoking history?	<ol style="list-style-type: none"> 1. Do you smoke? 2. Do you smoke or have you ever smoked? 3. Do you smoke or have you smoked in the past for 3 months consecutively?
When assessing smoking history, do you document pack years?	<ol style="list-style-type: none"> 1. Yes 2. No
Do you look at your Care Gaps during each visit?	<ol style="list-style-type: none"> 1. Yes 2. No
Open Answer: What process or processes within the clinic do you believe could be improved to ensure all eligible patients are screened?	

Appendix C. Lung Cancer Poster

Get Screened for Lung Cancer?

You are at high risk IF:

- You are between 55 and 80 years old**
- AND**
- You are currently smoking or quit in the last 15 years**
- AND**
- You have a smoking history of at least 30 pack years***

Some people are at high risk for lung cancer.
A test, or screening – called a low-dose CT scan – helps find lung cancer before there are symptoms. The low-dose CT scan has been proven to save lives by finding lung cancer early.

IF THESE RECOMMENDATIONS APPLY TO YOU, talk to your doctor or other healthcare provider about lung cancer CT screening.

IF THESE RECOMMENDATIONS DO NOT APPLY, but you still worry about your risk for lung cancer, talk with your doctor or other healthcare provider.

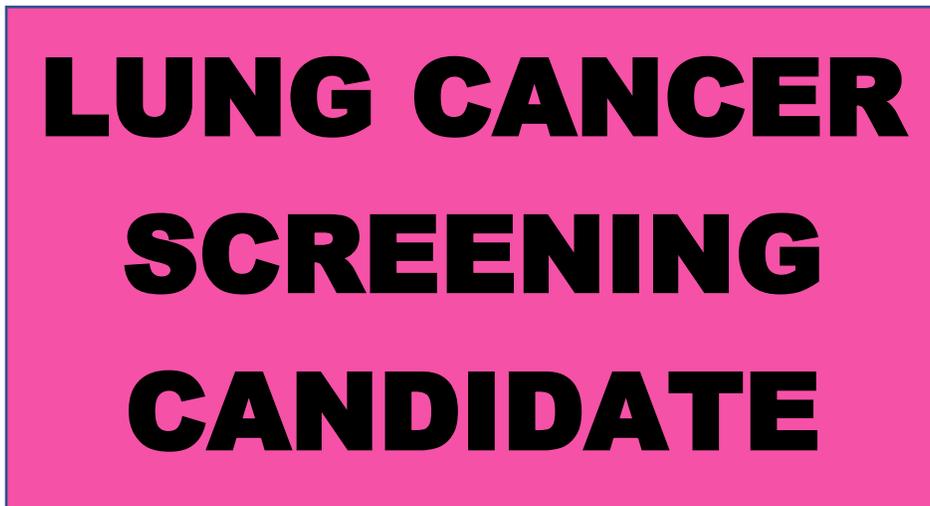
*pack years = your average # of packs per day X # of years smoked

EXAMPLES:
1 pack a day X 30 years = 30 pack years
1.5 packs a day X 20 years = 30 pack years

Based on the United States Preventive Services Task Force recommendation.
Adapted from materials of the Kentucky LEADS Collaborative.


www.lucatraining.org

Appendix D. Eye-catching Clinical Reminder



Appendix E. Process Map

