LUNG CANCER SCREENING: IDENTIFICATION OF HIGH-RISK PATIENTS AND
SHARE DECISION-MAKING

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LUNG CANCER SCREENING: IDENTIFICATION OF HIGH-RISK PATIENTS AND SHARED DECISION-MAKING

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ABSTRACT

Lung cancer is the most common cause of cancer-related deaths in the United States. Prevention and early detection of lung cancer are imperative in decreasing lung cancer mortality. Screening for lung cancer with low-dose computed tomography (LDCT) decreases lung cancer by 20%. Several organizations introduced lung cancer screening (LCS) guidelines in 2013, including Centers for Medicare and Medicaid (CMS) and the United States Preventive Services Task Force. However, LCS participation for eligible patients remains low, due in part to the complexity of the LCS process.

The goal of this practice improvement project was to increase the knowledge of rural primary care providers regarding LCS guidelines and the related CMS requirements and to increase their confidence in initiating shared decision-making (SDM) discussions. An educational intervention consisting of a LCS educational session and a toolkit was implemented in two rural clinics. Providers at both clinics reported a benefit to the educational intervention.

Pre-, immediate post-, and two-month post-education surveys were collected to evaluate the impact of the educational intervention, including provider knowledge of LCS guidelines and CMS requirements, and confidence in SDM. Project results demonstrated an increased knowledge of LCS guidelines and CMS requirements with the greatest knowledge at immediate post-education and a high level of knowledge remaining at two months post-education. A small, nonsignificant, increase in provider confidence in initiating SDM discussions occurred.

At both clinics, data collected through chart audit demonstrated an improvement in documentation needed to determine LCS eligibility and increased the percentage of patients identified at high risk for lung cancer and thus, eligible for LCS. At one clinic these changes were significant. The data were further examined for SDM discussions and referrals for LDCT or
to specialist for LCS with one clinic increasing SDM documentation and LDCT referrals post-education. In conclusion, although further research is needed in implementation processes of LCS, specifically in consistent documentation to improve determination of LCS eligibility of patients, this practice improvement project found education increased provider knowledge and ability to complete requirements needed to improve LDCT screenings for lung cancer.
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I wish to thank Ashley Medical Center Clinic and Redfield Clinic for allowing me to come into your organization and implement my practice improvement project. To the participants, your time is valuable and your willingness to participate reinforces your commitment and dedication to providing evidence-based care to your patients. To Dr. Tara Brandner, not only did you help to facilitate this project, serve on my committee, you are a great mentor and example of how I hope to treat my patients. I greatly respect your passion in this profession. I wish to thank the NDSU statistical consulting services for assistance in data analysis.

To a class as we finish this journey, we may have all traveled a similar, yet different path to come to where we are now and to where we may go in the future. I am grateful to each and every classmate for the individual differences that have enhanced my education. I have learned lessons from each and everyone. Finally, I want to give glory to Jesus Christ for helping me with this project, for providing insight when I needed it the most, and for allowing me to use my God given talents in caring for others. This verse that carried me through this project: “For with God nothing shall be impossible.” Luke 1:37.
DEDICATION

This dissertation is dedicated to my family.

My husband Shawn, for the support, laughs, encouragement and understanding. I am forever grateful to have you by my side as we traveled this journey and continue our future adventures.

To my children and grandchildren. Your understanding for missed visits, holidays and get together. Three years has passed fast, yet I am forever grateful for the understanding in letting your mom realize a dream.

To my parents, time is something you can never get back, with the completion of this journey, my hope is to spend more time with you. I am thankful you raised me to go after my dreams, no matter when.

“Be strong and courageous, all you who put your hope in the Lord.” Psalms 31:24
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LIST OF ABBREVIATIONS

ACS .................................................. American Cancer Society
SEER .................................................. Surveillance, Epidemiology, and End Results Program
CXR .................................................. Chest Radiograph
LCS .................................................. Lung Cancer Screening
NLST .................................................. National Lung Screening Trial
LDCT .................................................. Low-Dose Computed Tomography
USPTF ............................................... United States Preventive Task Force
SDM .................................................. Shared Decision-Making
AMC .................................................. Ashley Medical Center
CMS .................................................. Centers for Medicare and Medicaid Services
CDC .................................................. Center for Disease Control and Prevention
NSCLC ............................................... Non-Small Cell Lung Cancer
SCLC .................................................. Small-Cell Lung Cancer
DANTE ............................................... Detection and Screening of Danish Lung Cancer Screening Trial
DLCST ............................................... Danish Lung Cancer Screening Trial
VHA .................................................. Veterans Health Administration
ACA .................................................. Affordable Care Act
CHAPTER ONE. INTRODUCTION

Background and Significance

Lung cancer is the most common cause of cancer-related deaths and the second most common cancer for both men and women in the United States (American Cancer Society [ACS], 2019a). Despite occurring at similar rates to breast, prostate, and colorectal cancer, lung cancer accounts for three to four times more deaths (Detterbeck, Mazzone, Naidich, & Bach, 2013). For 2019, the ACS estimates there will be 228,150 new lung cancer diagnoses and 142,670 lung cancer-related deaths in the United States (ACS, 2019b). Although the incidence and mortality rates of lung cancer have slowly declined over the past decade, the overall five-year survival rate remains low (Mazzone et al., 2015). Moreover, for 2019, the ACS (2019b) estimates that 300 deaths in ND and 410 deaths in SD, will be attributed to lung cancer. In 2018, the estimated expenditure for lung cancer care in the United States was over $14 million, with an additional $36 billion loss in productivity related to lung cancer deaths (National Cancer Institute, 2018).

The stage of cancer diagnosis refers to the extent of cancer in the body and is the most substantial influence on the length of survival and treatment option. When diagnosed before metastasis, lung cancer five-year survival rates are considerably higher than the overall survival rates (Surveillance, Epidemiology, and End Results Program [SEER], 2018). Unfortunately, most lung cancer diagnoses are made at an advanced or metastatic stage, resulting in a high rate of lung cancer mortality (Patz et al., 2016). Localized lung cancer is most often asymptomatic, leading to a delay in diagnosis. More often, the patient presents with symptoms, or in an advanced stage, contributing to the high mortality rate (Moyer, 2014).

Major risk factors for lung cancer include increasing age and cumulative exposure to tobacco smoke. In fact, it may take as long as two decades for lung cancer to develop, putting
both current and former smokers at risk (Manser et al., 2013). This makes screening for lung cancer challenging. As early as 1970, studies using chest radiograph (CXR), with or without sputum cytology, for lung cancer screening (LCS) were conducted and failed to show a statistically significant decrease in lung cancer mortality (Wender et al., 2013). Released in 2010, the results of the National Lung Screening Trial (NLST, 2011) showed a 20% reduction in lung cancer mortality rates for high-risk patients screened with annual low-dose computed tomography (LDCT). These results were a defining moment for LCS and prompted the development of LCS guidelines.

In 2013, the ACS and United States Preventive Task Force (USPTF) released guidelines recommending annual LDCT for LCS in adults with a significant history of smoking (Eberth, 2015; Moyer, 2014). Several systematic reviews have evaluated the effectiveness, risks, and benefits of LCS with LDCT (Bach et al., 2012; Boiselle, 2013; Humphrey et al., 2013; Manser et al., 2013; Slatore, Sullivan, Pappas, & Humphrey, 2014). In addition to the demonstrated effectiveness of LDCT in reducing lung cancer mortality, the following associated harms were identified and discussed later in this paper: incidental findings, false-positives, invasive procedures, over-diagnosis, and radiation exposure (Wender et al., 2013). Based on findings of benefits and harms, Wender et al. (2013) determined that more data are needed to assess the cost-effectiveness of LCS with LDCT. Mazzone et al. (2018) found LCS to be a balance of benefits and harms. A thorough understanding of the screening process by providers is essential to optimize the benefits of LCS.

Prevention and early detection of lung cancer are vital for decreasing lung cancer mortality (Wood et al., 2018). However, LCS is a complex process beginning with the
identification of eligible individuals (Ramsey et al., 2015). Research has shown that very few
eligible individuals have been screened for lung cancer (Huo, Shen, Volk, & Shih, 2017).

An integral part of LCS is shared decision-making. Shared decision-making (SDM) is a
process between healthcare providers and patients to facilitate decisions based on clinical
evidence and the patient’s values (Politi, Wolin, & Legare, 2013). The process acknowledges
individual values and beliefs, allowing the patient to become an active partner with their provider
in reaching a mutually agreeable decision (Carter-Harris, Tan, Salloum, & Young-Wolff, 2016).
During the SDM discussion, the potential harms and benefits of LCS are discussed with eligible
patients (Carter-Harris et al., 2016).

Reimbursement of LCS by the Centers for Medicare and Medicaid Services (CMS)
requires documentation of SDM discussion and counseling for smoking cessation (CMS, 2015).
Mishra et al. (2016) noted an overall patient lack of awareness for LCS with LDCT, emphasizing
the importance of SDM visits. Additionally, SDM discussions are complicated by provider
perceived barriers and provision of inconsistent information to patients (Wiener et al., 2018).

Application of evidence-based practices for LCS is lacking in rural areas. Rural providers
are often faced with limited resources, decreased access, and lack of awareness of recommended
guidelines (Jenkins et al., 2018). This co-investigator’s clinical rotations in the rural settings of
Ashley Medical Center Clinic (AMC) in Ashley, North Dakota (ND) and Redfield Clinic in
Redfield, South Dakota (SD), provided the opportunity for initial observations relating to the
identification of patients eligible for LCS and SDM discussions. Both facilities assessed patients’
smoking status and the amount smoked. This data were documented in the patient’s record.
However, documentation of pack-years and eligibility for LCS was inconsistent. In addition, no
SDM discussions or referrals for LDCT for LCS were observed. Based on the USPSTF grade B
recommendation and CMS support for annual screening, key providers at the clinics verified the need to implement LCS guidelines. Education involving LCS guidelines and SDM were requested by stakeholders at both clinics as part of the implementation strategy.

**Problem Statement**

In 2015, the CMS announced reimbursement for annual LCS for high-risk patients to increase early detection of lung cancer and subsequently decreasing lung cancer mortality (CMS, 2015). Several articles have described considerations for the implementation of LCS guidelines (Mazzone et al., 2015; Mazzone et al., 2018; Ramsey et al., 2015; Wiener et al., 2018). According to Hoffman et al. (2015), overall awareness and knowledge of LCS guidelines by both the patient and provider hindered the implementation of the screening guidelines in the rural setting. This lack of knowledge directly affects the SDM process, creating another barrier to guideline implementation (Mishra et al., 2016).

**Purpose**

The purposes of this practice improvement project was (a) to increase the knowledge of rural primary care providers regarding LCS guidelines and the related CMS requirements and to increase their confidence in initiating SDM discussions through the development and implementation of LCS education and (b) to determine the impact of the project.

**Objectives**

The project objectives were as follows:

1. Develop and implement an educational intervention consisting of an education session and lung cancer screening toolkit, regarding lung cancer screening and the CMS required shared decision-making discussion elements to improve the use of published lung cancer screening guidelines by providers.
2. Determine the impact of the intervention by assessing for an:

   a. Increase in the knowledge of rural primary care providers regarding lung cancer screening guidelines and the related CMS requirements for lung cancer screening and shared decision-making discussions.

   b. Increase in the confidence of rural primary care providers initiating shared decision-making discussions.

   c. Increase number of patients identified at high-risk for lung cancer and eligible for lung cancer screening by rural primary care providers.

   d. Increase number of shared decision-making discussions, inclusive of all required elements, initiated between rural primary care providers and patients at high-risk for lung cancer.

   e. Increase number of referrals for low-dose computed tomography or to specialist for lung cancer screening in eligible high-risk patients by rural primary care providers.
CHAPTER TWO. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

A literature search was conducted to review evidence regarding a) lung cancer; b) morbidity and mortality rates; c) recommended screening methods; d) barriers to LCS; e) provider knowledge of LCS guidelines; and f) SDM. The search was conducted using the Web of Science, Cochrane, PubMed, and MEDLINE databases for articles published from January 2013 to April 2019. An additional search was conducted to review additional evidence published from April 2019 through January 2020.

Search criteria included peer-reviewed journals, full-text articles published in the English language, including clinical trials, review, systematic reviews, and evidence-based clinical guidelines. Keywords used in the search included “lung cancer screening guidelines” AND “shared decision making”, “lung cancer screening implementation” AND “primary care”. An additional review of relevant grey literature, including factsheets, governmental documents, and committee reports was conducted. A secondary search of reference lists was also reviewed for possible inclusion (see Appendix A for search strategy).

Disease Presentation

Increasing age and cumulative exposure to tobacco smoke are major risk factors for lung cancer. Smoking is the leading modifiable risk factor for lung cancer and is responsible for 81% of all lung cancer deaths (ACS, 2019a). The Center for Disease Control and Prevention (CDC) (2018) reported that smokers are 15 to 30 times more likely to be diagnosed with lung cancer or die from lung cancer than non-smokers. Current or former smokers make up roughly 37% of adults in the United States, despite diligent efforts toward smoking cessation and an overall decline in smoking rates (Moyer, 2014). As with most cancers, the incidence of lung cancer increases with age. In the United States, the average age for lung cancer diagnosis is
approximately 70 years old, with less than 10% occurring in individuals less than 50 (Lung Cancer Alliance, 2019).

According to the CDC (2018), lung cancer is ranked as the third most common cancer in ND, behind breast and prostate cancer. In 2016, the incidence of lung cancer in ND was 53.6 per 100,000 people with a mortality rate of 34.6 per 100,000 people, ranking lung cancer the highest cause of cancer death. Closely resembling ND, lung cancer in SD is also ranked the third most common cancer and the most common cause of cancer death. In 2016, the incidence of lung cancer in SD was 58.2 per 100,000 people with a mortality rate was 39.4 per 100,000 people.

Most lung cancer is categorized into non-small cell lung cancer (NSCLC) and small-cell lung cancer (SCLC). NSCLC makes up 85% of all lung cancer cases and is further classified as adenocarcinoma (41% of lung cancer cases); squamous cell and transitional cell carcinoma (21%); large cell carcinoma (3%); and not otherwise specified (20%) (Howlader et al., 2018). This categorization is the basis for the management, prognosis, and screening efficacy of lung cancer. Commonly occurring in the larger airways, SCLC is characterized as aggressive cancer with early metastasis, making detection difficult (Nanavaty, Alvarez, & Alberts, 2014). Whereas, NSCLC is found in the peripheral lung tissue, allowing for easier detection through screening, contributing to the increased five-year survival rates (Howlader et al., 2018).

The ACS (2019a) has reported that approximately 57% of lung and bronchus cancer is diagnosed after or at the point of metastasis. This contrasts with the 16% diagnosed in a localized stage. When diagnosed early, the five-year survival rate of lung cancer is 57%, considerably higher than the overall lung cancer five-year survival rate of 18% (SEER, 2018). Patients diagnosed with localized lung cancer have the best chance for cure or long-term-survival with
surgical resection, endorsing the need for screening and early detection (Rai, Doria-Rose, Silvestri, & Yabroff, 2019).

**Lung Cancer Screening**

Lung cancer treatment success is associated with the stage at the time of diagnosis. Strategies to decrease lung cancer mortality include treatment, prevention, and early detection. Undoubtedly, prevention is the most crucial strategy with smoking cessation verified as the most effective intervention (Richards, White, & Caraballo, 2014). Moreover, screening with LDCT has shown that diagnosis at an early stage improves overall survival rate and clinical outcomes (Wender et al., 2013). The goal of any screening is to decrease mortality without causing harm and early detection of lung cancer through screening has shown promise in reducing lung cancer mortality (Detterbeck et al., 2013).

Early LCS research examined the use of CXR, with or without sputum cytology, to identify early lung cancer and subsequently reduce lung cancer mortality (De Koning et al., 2014; Humphrey et al., 2013). Wender et al. (2013) reported that four random control trials (RCT) failed to show a statistically significant reduction in mortality and as a result, the ACS removed the recommendation to screen current and former smokers with CXR. Whereas, several studies have demonstrated the effectiveness of LDCT in detecting early-stage lung cancer (Bach et al., 2012; De Koning et al., 2014; Horeweg et al., 2014; Humphrey et al., 2013; Infante et al., 2015; Kandora, Silvestri, & Tanner, 2015; Manser et al., 2013; Patz et al., 2016; Slatore et al., 2014; The NLST Research Team, 2011; Wille et al., 2016).

The NLST (2011), the largest RCT published to date, included 53,434 participants in 33 centers across the United States. The results of the trial found that screening with LDCT reduced the relative risk of death from lung cancer by 20% (95% CI, 6.8-26.7; \( p = .004 \)) when compared
to screening with CXR (NLST, 2011). The results concluded that in order to prevent one death from lung cancer, 320 individuals would need to be screened with LDCT. These findings are similar to the number of women greater than 50 years of age that needed to be screened with mammography to prevent one death from breast cancer (Kandora et al., 2015).

Early results from the Dutch Belgian Lung Cancer Screening trial (NELSON), the second largest RCT, suggested that screening with LDCT decreased lung cancer mortality by greater than 25% (De Koning et al., 2014; Kandora et al., 2015). The smaller NELSON study randomized 15,822 participants and compared screening for lung cancer with LDCT to no screening. Final results for the NELSON study, released during the International Association for the Study of Lung Cancer concluded that overall, LDCT scanning decreased mortality by 26% in high-risk men and 61% in high-risk women over a 10-year period, confirming the value of LDCT screening for lung cancer in high-risk individuals (De Koning, Van Der Aalst, Ten Haaf, & Oudkerk, 2018).

Other trials, including two European trials, failed to show a positive effect of LDCT on lung cancer mortality (Infante et al., 2015; Wille et al., 2016). The Detection and Screening of Early Lung Cancer by Novel Imaging Technology and Molecular Essays (DANTE) trial and the Danish Lung Cancer Screening Trial (DLCST) compared annual LDCT with usual care. The smaller study populations and lower risk groups screened in these trials attributed some of the differences when compared to the NLST (Mazzone et al., 2018).

Benefits of Lung Cancer Screening

As discussed previously, the most important benefit of LCS is early detection and a reduction of lung cancer mortality rate. The results of the NLST and NELSON trial demonstrated a reduction in lung cancer mortality with annual LDCT screening of high-risk
individuals (De Koning et al., 2018; NLST, 2011). The benefits of LDCT screening are personalized, with individuals at the highest risk for lung cancer being most likely to benefit from screening (Moyer, 2014). Screening with LDCT leads to an increase in early detection of lung cancer and a better prognosis.

Smoking cessation is the most effective method in preventing lung cancer and decreasing lung cancer mortality. The effect of LDCT screening on smoking cessation or reinitiation has not been substantiated (Bach et al., 2012). Still, LCS provides an opportunity to educate current smokers on smoking cessation. There is some data indicating a positive effect of LDCT screening on smoking cessation in individuals (Richards et al., 2014). Mishra et al. (2016) reported that participating in LCS with LDCT is not by itself a strong disincentive to smoking. They found that a positive finding provided motivation to stop smoking, and even more so after viewing a lung nodule, however a negative finding is not sufficient to encourage smoking cessation. However, some studies have suggested that LDCT screening may result in continued smoking as individuals feel protected by the screening (Mazzone et al., 2018).

Nevertheless, the effect of screening as motivation to stop smoking has not been established. No difference in smoking cessation rates was found in the LDCT screening and control groups in the DLCST and NELSON trials; however, higher smoking cessation rates in the LDCT group were noted for the UK Lung Cancer Screening Trial (Mazzone et al., 2018). More recently, Huo et al. (2019) found no association with any change in smoking behavior in the six months following LCS. However, smoking cessation remains an integral part of LCS guidelines and is required by CMS as part of LDCT lung cancer screening (CMS, 2015; Mishra et al., 2016).
Risks of Lung Cancer Screening

Although LCS with LDCT show promise in reducing lung cancer mortality, LDCT is not without risks. Several studies have identified harms from LCS with LDCT (Bach et al., 2012; Humphrey et al., 2013, Mazzone et al., 2018; Moyer, 2014; National Comprehensive Cancer Network [NCCN], 2019). The most commonly discussed harms are related to the identification and evaluation of lung nodules, including false positive results, the significance of incidental findings unrelated to lung cancer, the possibility of overdiagnosis and overtreatment of lung cancer, the effects of cumulative radiation exposure, and the psychological effects of these findings. Understanding the impact of LCS harms are important in-patient discussions. Arenberg (2019) found that harms of screening are often both overestimated and underestimated by poorly informed patients and providers.

False Positives

The most discussed risk associated with LCS is the high rate of false-positive results. Approximately 95% of all positive screening results do not result in cancer diagnosis (Moyer, 2014). A false-positive result can lead to further testing and invasive procedures, increasing distress, and cost (NCCN, 2019). The NLST (2011) reported a false-positive rate of 96% in the CT screening group with a cumulative risk of a false-positive result of 33% with two annual screenings. In studies reviewed by Humphrey et al. (2013), the majority of invasive procedures were performed for cancer with a positive predictive value ranging from 50% to 92%. Arenberg (2019) reported an increasing number of invasive procedures in routine practice as compared to the clinical trial. This finding stresses the need for strategies to reduce the number of invasive procedures used to investigate screening detected nodules.
Incidental Findings

Incidental findings commonly identified with LDCT include coronary artery calcification, emphysema, bronchiectasis, pulmonary fibrosis, and carcinoid tumors (Moyer, 2014). Mazzone et al. (2018) reported the prevalence of incidental findings ranging from 41% to 94% on initial scans. Approximately 40% of veterans screened in the Veterans Health Administration (VHA) demonstration project reported incidental findings (Kinsinger et al., 2017). Incidental findings require health providers time to determine if additional testing is required, and the value of these findings has not been defined. Incidental findings and false positives can lead to emotional distress, invasive procedure and additional testing in patients (Boiselle, 2013; Wender et al., 2013). However, evidence of the harms associated with incidental findings has not been established (Moyer, 2014).

Overdiagnosis

Although no studies have officially reported overdiagnosis, results from the NLST found 119 more lung cancer cases in the LDCT group than the CXR group after more than six years of follow-up, suggestive of some overdiagnosis (Humphrey et al., 2013). Overdiagnosis with LDCT screening can result in unnecessary treatment and therapy, potentially inflicting harm on the patient (Moyer, 2014). The impact of overdiagnosis is affected by the definition used. A standard definition of overdiagnosis is histologically confirmed clinically insignificant cancers. In other words, lung cancer, that if not identified through screening and left untreated, would not have affected the patient (Bach et al., 2012). Mazzone et al. (2018) describe an extension of this definition to include any lung cancer diagnosed in a patient with comorbidities leading to death before the cancer affected their well-being. Otherwise stated, by extension, an early lung cancer detected through screening may not affect an individual that died during the early asymptomatic
stage of lung cancer. This further emphasizes the significance in selecting patients for screening without comorbid conditions that overshadow the risk of lung cancer related death.

**Radiation Exposure**

Frequent or repeat LDCT screening increases an individual’s exposure to radiation. In comparison, radiation exposure associated with LDCT is close to the exposure associated with mammography (Humphrey et al., 2013). Harms associated with radiation exposure include cancer from cumulative exposure to radiation. The amount of exposure varies depending on the number of scans and other sources of radiation (Moyer, 2014). Also, the risk of radiation exposure is related to the age when screening begins and the sex of the patient (Mazzone et al., 2018). Prediction models using NLST data have estimated one radiation caused cancer death for every 2500 persons screened, illustrating that the benefit of preventing lung cancer mortality is greater than the radiation risk (Bach et al., 2012).

**Psychological Effects**

Little research is available to support or refute effects on quality of life from LCS (NCCN, 2019). A systematic review by Slatore et al. (2014), identified three studies (two RTCS and one cohort) that evaluated the effect of LDCT lung cancer screening on patient-centered outcomes. Individuals with positive or indeterminate results experienced a short-term increase in distress and anxiety, with no long-term differences reported. In comparison to other cancer screenings, these findings were similar to patients with negative mammograms.

Consequently, the review noted that non-participants in one study (DLSCT) had more negative psychosocial characteristics than participants (Slatore et al., 2014). Overall, the evidence was of fair quality, and at best suggests that LCS with LDCT is associated with short-term psychologic discomfort and false-positive results are connected to slight increases in
distress. Mazzone et al. (2018), confirmed that the detection of nodules during screening might
transiently increase distress without an adverse effect on anxiety levels. Distress can be
alleviated in both participants and non-participants by decreasing false positives and increasing
communication strategies to ensure the provision of adequate information, consideration of
individual values and preferences, and SDM.

**Lung Cancer Screening Recommendations**

The most important part of a screening program is the identification of individuals who
will benefit the most from the screening interventions and experience the least amount of harm.
The increasing risk of lung cancer is directly related to cumulate exposure to tobacco and age
(Humphrey et al., 2013). The NLST demonstrated the best evidence for the benefit of screening.
Participants in the trial were 55 to 74 years with a 30 pack-year smoking history; and included
both current smokers and former smokers who have quit within the past 15 years (NLST, 2011).
The participants were screened annually for three years, making the oldest participant 77 years
old.

With the 2011 release of the NSLT report, several organizations updated or developed
LCS recommendations. Although guidelines differ, eligibility for screening is similar to the
inclusion criteria of the NLST for all the recommendations (see Table 1). The NLST participants,
compared to the general US population eligible for LCS, were found to be younger, had a higher
level of education, more likely to be a former smoker, and less likely to be a member of a
minority group (Kandora et al., 2015). Additional risk factors for lung cancer, including asbestos
exposure, secondhand smoke exposure and radon exposure are difficult to quantify into existing
lung cancer risk models (Arenberg, 2019). As such, current recommendations for lung cancer
screening eligibility in the guidelines do not include other causes of lung cancer.
Table 1

**Lung Cancer Screening Guideline Recommendations.**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Age in years</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>USPSTF&lt;sup&gt;a&lt;/sup&gt;</td>
<td>55 - 80</td>
<td>≥ 30 pack-year current or former smoker with smoking cessation within past 15 years</td>
</tr>
<tr>
<td>ACCP/ASCO&lt;sup&gt;b&lt;/sup&gt;</td>
<td>55 – 74</td>
<td>≥ 30 pack-year current or former smoker with smoking cessation within past 15 years</td>
</tr>
<tr>
<td>AATS&lt;sup&gt;c&lt;/sup&gt;</td>
<td>55 – 79 Until 79</td>
<td>≥ 30 pack-year smoking history &gt; 5-year lung cancer survivor without recurrence ≥ 20 pack-year smoking history and added risk of developing lung cancer ≥ 5% in 5 years</td>
</tr>
<tr>
<td>NCCN&lt;sup&gt;d&lt;/sup&gt;</td>
<td>55 – 74</td>
<td>≥ 30 pack-year current or former smoker with smoking cessation within past 15 years ≥ 50</td>
</tr>
<tr>
<td>ACS&lt;sup&gt;e&lt;/sup&gt;</td>
<td>55 – 74</td>
<td>≥ 30 pack-year current or former smoker with smoking cessation within past 15 years and in relatively good health</td>
</tr>
<tr>
<td>ALA&lt;sup&gt;f&lt;/sup&gt;</td>
<td>55 – 74</td>
<td>≥ 30 pack-year current or former smoker with smoking cessation within past 15 years</td>
</tr>
</tbody>
</table>

<sup>a</sup>USPSTF, United States Preventive Services Task Force (Moyer, 2014)

<sup>b</sup>ACCP, American College of Chest Physicians; ASCO, American Society of Clinical Oncology (Detterbeck et al., 2013)

<sup>c</sup>AATS, American Association of Thoracic Surgeons (Jaklitsch et al., 2012)

<sup>d</sup>NCCN, National Comprehensive Cancer Network; additional risk factor includes chronic obstructive pulmonary disease, environmental/occupational exposure, prior cancer/radiation therapy and general family history (Wood et al., 2018)

<sup>e</sup>ACS, American Cancer Society (Wender et al., 2013)

<sup>f</sup>ALA, American Lung Association (ALA, 2018)

The USPSTF conducted a thorough systematic review of LCS evidence and applied modeling studies to the various screening recommendations. Based on these findings, the USPSTF projected a substantial balance of benefits and harms with annual LDCT screening of adults at high risk for lung cancer (Humphrey et al., 2013). Arenberg (2019) stated “the importance of this modeling is that the eligible population of smokers in the US is different from the subjects in the NLST” (p.S78). De Koning et al. (2018) reported that approximately 50% of lung cancer cases would be detected at an early stage with annual LDCT screening for individuals ages 55 through 80 years with a 30 pack-year smoking history; this includes current smokers or former smokers who quit within the past 15 years.
The USPSTF (2013) issued a Grade B recommendation for LCS indicating that "there is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial" (recommendation summary section). Per the USPSTF (2013), screening should discontinue once a person has not smoked for 15 years, develops a health problem that limits life expectancy, or inability or unwillingness to have curative lung surgery. In 2015, in response to the USPSTF’s Grade B recommendation, the CMS-approved reimbursement of LCS with LDCT for high-risk patients (CMS, 2015). Refer to Appendix B for CMS lung cancer screening requirements.

An estimated 12,000 lung cancer-related deaths per year can be attributed to the low uptake of LCS guidelines and underscreening (Jemal & Fedewa, 2017). In fact, the 2015 National Health Interview Survey noted that only 5% of eligible individuals had been screened for lung cancer (Huo et al., 2017). Challenges in the implementation of LCS with LDCT identified in a recent VHA study included difficulty in identifying patients eligible for screening (Kinsinger et al., 2017).

In another study, Lewis et al. (2019), surveyed 625 providers in an academic medical center and compared providers knowledge of LCS guideline and LDCT referrals. Results of the survey found that providers with low LCS knowledge were less likely to order LDCT. A noteworthy finding of the study is the current low knowledge of LCS guidelines. Substantiating the need for additional provider education. Knowledge was measured as a continuous variable based on the number of correct LCS guideline knowledge questions. Knowledge of initial screen age of 55, both current and former smoking status, annual screening interval, and no LCS recommendation for patients unable to undergo surgery were the most strongly associated with LDCT order / referral.
Several articles have described considerations for the implementation of LCS guidelines (Mazzone et al., 2015; Mazzone et al., 2018; Ramsey et al., 2015; Wiener et al., 2018). In primary care, a standardized approach should include the question of who to screen; identification of eligible patients; how to conduct an SDM visit; communication and management of LDCT results; and incorporation of smoking cessation (Mazzone et al., 2018). This approach is congruent with Ramsey et al. (2015) findings, which identified several components to successful lung cancer screening, including correctly identifying individuals eligible for selection; providing access to screening; ensuring appropriate follow-up of positive and negative screening results; and offering smoking cessation support. Counseling on the risks and benefits of lung cancer screening, as well as smoking cessation, should be provided to all individuals identified as high-risk for lung cancer and eligible for LCS.

Ramsey et al. (2015) described primary care providers as ideally positioned to identify high-risk eligible patients and conduct SDM visits. Most primary care providers currently collect patient’s smoking status as part of CMS’s meaningful use core measures. Documenting smoking history, including how much and how long a patient has smoked, appears to be a logical extension of this history.

**Shared Decision-making**

Considering the high percentage of false-positive results and commitment to follow-up associated with LCS; the risks and benefits of screening should be thoroughly discussed with eligible individuals before LDCT screening (De Koning et al., 2014). The CMS recognizes the importance of SDM, and in fact, LCS was the first cancer screening modality in which the CMS required documentation of an SDM visit for reimbursement (Carter-Harris et al., 2016). Bryne,
Thurer, and Studts (2019), found that presenting information in a comprehensible, relevant manner to elicit patient preferences is important aspect of SDM.

Lung cancer screening guidelines recommend an informed or SDM discussion regarding the benefits of LCS, limitations, known harms, and potential harms (Detterbeck et al., 2013; NCCN, 2019; Moyer, 2014; Wender et al., 2013). Likewise, the SDM visit should include the determination of eligibility for LCS (Mazzone et al., 2018). The SDM discussion should inform patients that undergoing LDCT may not prevent lung cancer death or identify all lung cancers (NLST, 2011). High-risk individuals should be counseled about false-positive results, and that a positive test does not mean they have lung cancer and may require further testing (Wiener et al., 2018).

Patients should understand that LCS is an ongoing process and commitment to the follow-ups are an essential part of the screening process (NCCN, 2019). Moreover, patients should be aware that LCS is not recommended if they are unable or unwilling to have curative therapy because of health or other significant problems (Moyer, 2014). Early diagnosis of lung cancer has less of an impact on a patient with a significant comorbid disease limiting life expectancy (Arenberg, 2019). The patient assessment should include a functional status assessment to determine if patients can survive or are willing to undergo lung cancer treatment. The number needed to screen to prevent one death for lung cancer and breast cancer are comparative. However, if treatment is not followed after a positive screening, the patient’s cancer has not been deterred, negatively affecting the efficacy of LCS (Erkmen et al., 2017).

Despite recommendations for SDM, several studies have reported variable use and an inconsistent inclusion of patient preferences (Carter-Harris et al., 2016; Kandora et al., 2015; Lowenstein et al., 2019; Wiener et al., 2018). A qualitative study by Lowenstein et al. (2019),
found that patients and providers perceived LCS and SDM differently. In their study, patients, strongly influenced by emotional factors, were more likely to emphasize the benefits and minimize the risks of LCS. Conversely, providers in the study placed greater emphasis on potential harms.

Recent studies have demonstrated limited use of SDM and included only minimal information on the harms of screening (Brenner et al., 2018; Wiener et al., 2018). Carter-Harris et al. (2016) found that current smokers, individuals with a family history of cancer, and individuals with health care coverage were more likely to report SDM discussions with their providers. Risk prediction models, developed for the determination of individuals at the highest risk for lung cancer, can be used to educate patients in understanding the individual risk for lung cancer and help them make informed decisions (Kandora et al., 2015).

Shared decision-making visits should occur in advance of the LDCT screening. In primary care settings outside of LCS programs, a standardized approach should ensure providers are trained in the identification of patients and conducting SDM visits (Mazzone et al., 2018). Providers should be aware of the counseling requirements and responsibility for conducting SDM visits. Bryne et al. (2019), found that a thorough understanding of factors affecting patient’s attitudes toward screening is vital to understanding how to engage patients in SDM. Research has demonstrated an increase in patient knowledge and understanding of LCS with the use of decision aids during SDM visits (Mazzone et al., 2018; Volk & Foxhall, 2015).

**Barriers to Shared Decision-making**

Shared decision-making discussions are challenging. Wiener et al. (2018) identified several barriers to conducting SDM visits, including competing demands for staff and lack of familiarity with LCS. Competing priorities, poor risk communication skills, and a perception that
patients do not want to engage in SDM have been described in other contexts in addition to LCS (Kandora et al., 2015). One of the more challenging barriers is the perception that patients will not understand or do not want to discuss LCS (Hoffman et al., 2015). Most recently, Huo et al. (2019), identified limited belief in LCS by primary care providers as a key barrier to LCS.

Additional barriers to SDM discussions and ultimately LCS, include a lack of awareness and knowledge of LCS guidelines, including the information required during the SDM discussion (Detterbeck et al., 2013). Barriers to LCS identified by Mishra et al. (2016) include the identification of eligible patients, the management of abnormal results, and the fears and stigma associated with lung cancer. The understanding of these barriers is essential to SDM discussions. Arenberg (2019) reported a lack of understanding of the risks and benefits of LCS inhibit effective discussions with less informed patients, regardless of time constraints.

Lung cancer screening with LDCT is covered under the Affordable Care Act (ACA). Despite CMS and private insurance coverage of LCS with LDCT, cost has been identified as a potential barrier to LCS (Boiselle, 2013). Hoffman et al. (2015) reported that additional costs are associated with follow-up testing to a positive finding and treatment for detected cancers. These costs are not covered as a preventive service under the ACA and are subject to deductibles with the potential to create a financial strain (Hoffman et al., 2015). Toumazis (2019), demonstrated that the cost effectiveness of LCS is associated with the harmful effects of indeterminate findings and should be included during SDM. Additional costs exist for rural patients and include costs related to travel and lost income from time away from work. Fully understanding potential costs is important for patients. Providing this cost information to patients during SDM discussions is important in ensuring the patient has a full understanding of the screening process.
Lung Cancer Screening in Rural Areas

Little research has been conducted on lung cancer screening in rural areas. Although the NLST (2011) established the benefit of LCS with LDCT, the population in the study was not indicative of a rural population. In a review by Jenkins et al. (2018), rural residents were identified as less likely to regularly see a primary care provider, have less access to smoking cessation programs, and experience a worse outcome for cancer diagnosis. A significant concern in rural areas is the decreased access to technology, thus forcing rural residents to travel and incur lost work time for LCS and follow-up (Hoffman et al., 2015).

In addition, Jenkins et al. (2018), identified rural individuals as having worse health outcomes and lower educational levels in comparison to urban individuals. Health literacy significantly impacts the provider’s ability to engage in SDM discussions and serves as a barrier to LCS. Simmons et al. (2017) concluded that a provider’s lack of knowledge regarding LCS with LDCT affects the willingness of rural providers to recommend LCS.

Malcolm Knowles’ Adult Learning Theory

Malcolm Knowles’ Adult Learning Theory was selected as the theoretical framework to guide the development and application of education for this project. Knowles’ theory is based on the concept of andragogy or helping adults to learn (Merriam, 2018). Introduced in 1973, the model characterizes the differences between “pedagogy (the art of helping children to learn) and andragogy (helping adults to learn)” (Spies, Seale, & Botma, 2015, para. 2). Knowles eventually recognized the continuum of teacher-directed pedagogy to student-directed learning (andragogy) and appropriateness of using both approaches in adult learning (Merriam, 2018). The use of the Adult Learning Theory helps to provide the most appropriate education to promote how adults learn best.
Andragogy attempts to identify how adult learners learn and how to involve them in the learning process. The theory is focused on the understanding that the lecturer does not possess all the knowledge and that students are encouraged to participate in education by using their own experiences (Spies et al., 2015). The following andragogy principles were applied to the development and execution of education for this project.

The first principle is the intrinsic motivation to learn. Adults learn best when they understand why something is important (Merriam, 2018). Motivation to learn comes from both internal and external factors. Adult learners place more priority on internal factors and need to be aware of the reason for education (Spies et al., 2015). Participants in the project were informed of the benefits to using LCS guidelines in their practice by the provision of the education objectives. New knowledge can impact the provider’s practice, resulting in increased personal and patient satisfaction.

The next principle is the readiness to learn. For adults, readiness to learn is often influenced by their need to know or do something (Merriam, 2018). Adult learning is problem-centered or life-centered in comparison to subject-matter orientation (Spies et al., 2015). As such, adult learners prefer education presented using real-life situations (Merriam, 2018). The presentation portion of the educational component focused on a case study to illustrate the components and requirements of LCS. In addition, the LCS toolkit provides educational material for additional learning based on the provider’s readiness to learn.

The third principle is that adult learners possess prior experience. Adult learners enter learning situations with life experiences that affect how they process information and retain information (Merriam, 2018). The adult learner, feeling responsible for their learning, will resent the lecturer’s ideas being forced upon them, rather than acknowledging their prior knowledge.
(Spies et al., 2015). Adults learn best when the learning is experiential. Key stakeholders for this project identified LCS knowledge deficits for respective sites. T. Brandner, DNP, FNP-C (personal communication, August 19, 2019), noted that LCS guidelines were not implemented at AMC and identified the need for education regarding LCS guidelines and SDM elements. K. Baloun (person communication, August 23, 2019), identified that providers at Redfield Clinic are not consistently documenting smoking history pack years and the required SDM elements. She reported that recently the LDCT order in the electronic health record (EHR) was revised to include required the CMS elements, making education of LCS guidelines and SDM timely. In addition, the use of the case study during the education session allows providers to draw on past experiences and knowledge to help determine their actions and responses.

Orientation to learning is the fourth principle of andragogy. As previously mentioned, adult learners prefer a problem-solving approach in contrast to a subject-centered approach (Park, Robinson, & Bates, 2016). Adults are more motivated in learning information that helps to solve problems with the ability to apply the new knowledge immediately (Spies et al., 2015). Primary care providers are in a position to decrease lung cancer mortality through identification of patients eligible for LCS and SDM. In addition, through primary care provider’s regular interaction with patients, emphasis on continuing the LCS process is possible. Having resources available to ensure providers possess the most current information is necessary for the LCS process and SDM discussions with patients. The LCS education session and toolkit provided up to date information available for immediate use in the provider’s practice. In addition to the toolkit binder, an electronic version was provided to the key stakeholders. The toolkit provided internet links for current resources.
The fifth principle is self-directed learning. Adult learners have individual self-concepts and respond to education led by self-directedness (Spies et al., 2015). Despite having learning needs that are influenced by societal and social roles, adults have progressed from a dependent personality to an independent, more self-directing individual (Merriam, 2018). Any opportunity to control or provide input into the education enhances the learning experience for the adult (Park et al., 2016). Key stakeholders from both sites were contacted during the development of the education session and toolkit to ensure information was relevant and needed at the respective sites. The toolkits, both binder and electronic version, included the PowerPoint presentation for self-directed learning or review of presentation.

The final principle is the need to know. Adult learning is best achieved when they understand why they need the information prior to participating in the education session (Spies et al., 2015). Objectives for the LCS education session were provided to the participants prior to the education session, allowing for the participants to understand why the information is essential to them and helped to establish personal value for the education. The importance of understanding LCS guidelines and SDM was highlighted at the start of the education session, emphasized throughout the session, and reviewed at the conclusion to improve the understanding of the project’s impact on specific learning goals. During the education session, input from participants reinforced the value in the education sessions.
CHAPTER THREE. METHODS

Project Design

The design of this project is practice improvement, with implementation of an evidence-based intervention in two healthcare settings, pre- and post-tests, and chart audit. The purposes of this project and specific objectives are included in Chapter One. Using the best evidence available, the project translates evidence into clinical practice.

Project Implementation Plan

IOWA Model

Evidence-based practice (EBP) combines clinician expertise, patient preferences, and values with the best evidence from well-designed research as a guide to problem-solving (Dang et al., 2015). EBP models are used to assist healthcare providers in the integration of best evidence into clinical practice. For this project, the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Appendix C) was used to facilitate the implementation of the USPSTF’s LCS guideline at AMC and Redfield Clinic. The Iowa Model, consisting of several problem-solving steps and feedback loops, is widely used and validated as a guide for EBP projects (Iowa Model Collaborative, 2017). Permission to use the model was obtained from the University of Iowa Hospitals and Clinics (Appendix D).

Identification of a problem-focused or knowledge-focused trigger is the first step in the Iowa Model (Iowa Model Collaborative, 2017). "Triggers" arise from questions surrounding current practice or acquisition of new knowledge, such as a guideline, leading to opportunities for practice change and improved patient outcomes (Dang et al., 2015). Since 2013 when the ACS and USPSTF released LCS guidelines, implementation of the guidelines has been slow. The 2015 National Health Interview Survey noted that only 5% of eligible individuals eligible
had been screened for lung cancer (Huo et al., 2017). Challenges in the implementation of LCS with LDCT identified in a recent VHA study included difficulty in identifying patients eligible for screening (Kinsinger et al., 2017). Based on the USPSTF grade B recommendation and CMS support for annual screening, key stakeholders at the clinics verified the need to implement LCS guidelines. Education regarding LCS guidelines and SDM was requested as part of the implementation strategy.

The next step is to determine if the change is a priority for the organization. Implementation of LCS guidelines in the clinics needed to be considered an organizational priority for the success of the project (Brown, 2014). Key stakeholders expressed support and interest in LCS education and implementing LCS guidelines in the clinics (T. Brandner, personal communication, August 19, 2019; K. Baloun, personal communication, August 23, 2019). Once the change is deemed a priority, the next step is to form a team of stakeholders to help develop, evaluate, and implement the practice change (Brown, 2014).

Stakeholders for this project were numerous. Lead team members consisted of the co-investigator; advance practice nurse and unit manager at AMC; and unit manager at Redfield Clinic. Additional team members at AMC included advance practice nurses, and clinic support staff at AMC. Additional team members at Redfield Clinic included physicians, advance practice nurse, physician assistants and clinic support staff. Although the additional team members were not as active in the development of the project, their input and cooperation were imperative for the evaluation and implementation of the practice change. My role as the co-investigator was to provide education and facilitate implementation and use of the LCS guideline. The dissertation committee for the project included Dr. Kelly Buettner-Schmidt as chair from the School of
Nursing, Dr. Dean Gross from the School of Nursing, Dr. Christopher Whitsel as North Dakota State University graduate appointee, and Dr. Tara Brander, nurse practitioner from AMC.

The next steps are to gather, critique, and synthesize relevant research related to the proposed practice change (Iowa Model Collaborative, 2017), this has been accomplished through the review of literature provided in this dissertation. Through the project proposal process, the literature review and from key stakeholders, it was determined that enough evidence for a practice change existed.

The next step is to design and pilot the practice change. This project was modeled after a similar project that introduced and educational toolkit for lung cancer screening (Cloonan, 2017). Similar to Cloonan (2017), this project included an education session and toolkit and evaluated with a pre-, immediate post-, and two-month post-education evaluation. The project completed by Cloonan (2017), will be considered the pilot. Following the project approval by the Dissertation Committee and subsequent IRB approval, this co-investigator developed and implemented the practice change intervention at both clinic sites.

Following implementation, continued evaluation is needed to identify deviations and reinforce the change (Brown, 2014). One month following the implementation of the educational intervention, key stakeholders at both clinics were contacted to identify any additional educational needs related to LCS guidelines. Additional education and resources requested by the clinics were provided by the co-investigator.

Finally, dissemination of the results is vital for professional learning and the generation of additional practice questions or triggers (Dang et al., 2015). Dissemination of results occurred through this dissertation and executive summary (Appendix E). The executive summary was
provided to the stakeholders via an electronic email. In addition, the author will develop a three-minute thesis video and present a final poster at North Dakota State University on April 1, 2020.

Setting

The setting for this project consisted of two rural clinics. The clinics were selected after the co-investigator completed clinical rotations in both locations and observed inconsistent or lack of LCS guidelines use at the clinics. The first clinic, AMC, is located in southcentral ND. In 2017, the population of Ashley’s was 689 with a median age of 66.2 years (City-data.com, n.d.-a). The education session for the project was offered to the three nurse practitioners and six supporting clinic staff at AMC. Supporting clinic staff included a clinic manager, registration staff and nursing staff.

The second clinic, Redfield Clinic, is located in northcentral SD. In 2017, the population for Redfield was 2,295 with a median age of 44.9 years (City-data.com, n.d.-b). The education session for the project were offered to the three physicians, one nurse practitioner, three physician assistants and 25 supporting clinic staff. Supporting clinic staff included the Chief Executive Officer, medical records staff, a clinic manager, nursing staff, an administrative assistant and pharmacy professionals and staff.

Participants

Participants of the practice improvement project consisted of a purposive sample made up of providers from AMC and Redfield Clinic. Eligible providers included all providers employed at AMC and Redfield. In addition to providers at the clinics, the education session was offered to the supporting clinic staff. Evaluation surveys measuring knowledge and confidence were administered only to the primary care providers in attendance. Lung cancer screening toolkits were distributed to the primary care providers and clinics during the education session.
NDSU IRB approval (Appendix F) and institutional approval (Appendix G) was obtained prior to the project implementation. The surveys included a consent statement explaining that participation implied informed consent, participation was voluntary, and the decision to stop was the right of the participant. Risks to the participants included time to complete the survey and possible mild distress in completion of knowledge questions. The benefit of the educational intervention was available to all eight providers and clinical support staff in attendance at the education session. Benefits of the module included knowledge of LCS guidelines, CMS requirements for LCS and SDM. In addition to the education session, the LCS toolkit provided resources to assist in identifying eligible patients, initiating SDM discussions with patients, decision aids, and ensuring the required elements are met.

**Project Intervention**

The first objective for this project consisted of the development and implementation of an educational intervention. This project was adapted from a project that created an educational LCS toolkit and decision aid (Cloonan, 2017). The educational intervention consisted of an education session and LCS toolkit regarding LCS and CMS required SDM discussion elements. The educational intervention was developed based on the review of literature and with the input and approval of the dissertation committee. The education session consisted of a PowerPoint presentation concentrating on the knowledge of LCS and SDM using a case study developed by the co-investigator to enhance provider learning. Specifically, the education session focused on lung cancer and screening, benefits and harms of LCS, LCS guidelines, CMS requirements, elements of SDM discussions, and review of the LCS toolkit (Appendix H). The information presented was reinforced by clinic administration commenting that previous claims have been denied for lack of documentation. This information was well received by the providers.
The LCS toolkit was developed based on the review of various organizations’ recommendations, including the Agency for Healthcare Research and Quality, ACS, American College of Radiology, CDC, CMS, Lung Cancer Alliance, and USPSTF, and with input and approval of the dissertation committee. In addition to providing resources for patient education; information in the LCS toolkit included websites, decision aids, and checklists to help providers meet CMS requirements (see Appendix I). Three LCS toolkits were distributed to each of the clinics following the education session. In addition, the key stakeholders at each clinic were provided electronic copies of the toolkit. Each clinic was contacted one month following the education session and additional copies of the pack year calculator and decision aid were provided as requested.

**Project Evaluation**

To evaluate the first objective, two evaluations on paper, one at the conclusion of the education session and one two-months post-education session were collected. The LCS education session evaluation consisted of four Likert-scale questions measuring the content of the session as it relates to the providers educational needs and benefit to practice. Two additional questions were available for providers to add comments and suggestions for additional information. The LCS toolkit evaluation, collected two-months post education session, consisted of three Likert-scale questions measuring the content of the toolkit as it relates to the providers educational needs and benefit to practice. Two additional questions were available for providers to add comments and suggestions for additional information.

The second objective for this project was to determine the impact of the project intervention through the evaluation. The intervention evaluation consisted of participant surveys
and retrospective chart audits. IRB approval was received on October 15, 2019, prior to any data collection.

**Provider surveys**

Data collected through provider surveys were used to evaluate Objectives 1, 2a, and 2b. Project participants were asked to complete three paper surveys, one pre-education session, one immediate post-education session, and the third, two-months following the educational intervention. The survey was adapted with permission from a study by Lewis et al. (2019) regarding provider knowledge of LCS. The survey assessed guideline knowledge, patient eligibility, and SDM. The study by Lewis et al. (2019) defined high knowledge of LCS guidelines as correctly identifying the three major criteria of LCS: initial age, minimum smoking exposure, and smoking status, while low knowledge was defined as not identifying these three criteria. In addition, knowledge was converted into a continuous variable with zero correct items indicating the least knowledge and six correct the most knowledge. Lewis et al.’s survey was pilot tested with physicians, including cognitive interviews prior to use. Formal psychometric testing was not completed. See Appendix J for permission to use Lewis et al.’s survey.

All three surveys evaluated provider knowledge and confidence in relation to LCS guidelines and SDM. The pre- and two post-education surveys included identical questions regarding knowledge of LCS guidelines and the related CMS requirements for LCS and SDM discussions. In addition, the pre- and two post-education surveys included identical questions regarding confidence in the initiation of SDM discussions. See Appendix K for the questions included in the survey.

Prior to the education session, the paper pre-education survey and attached consent were distributed to the providers in attendance. Following the education session, the immediate post-
education survey and LCS education evaluation were distributed to participants of the education session to evaluate the co-investigators presentation (Appendix L). All surveys (pre-; immediate post-; and evaluation) were collected in a manila envelope at the completion of the education session. Due to the small sample size and to ensure anonymity the paper surveys from both sites were collected in the same manila envelope and resulted at the completion of the second education session. Two months after the education session, on January 20, 2020 and January 24, 2020, the third survey (two-month post-education survey) was distributed to participants that completed the pre-, and immediate post-education surveys by the co-investigator. The manila envelope for collecting surveys was placed on the clinic manager’s desk at Redfield. The providers upon completion, placed the surveys in the envelope and this co-investigator collected the envelope at the end of the day (January 20, 2020). The manila envelope for collecting surveys was placed on a desk next to the co-investigator during the chart audit on January 24, 2020 at AMC. The providers upon completion, placed the surveys in the envelope.

The LCS toolkit evaluation was distributed to the participants that completed the pre-, and immediate post-education surveys at the same time as the two-month post-education survey (Appendix M). The surveys and evaluations from both clinic sites were collected in the same manila envelope, stored in a locked drawer at the co-investigator’s residence and resulted together. After the completion of the results, the surveys were shredded.

**Retrospective chart audit**

The retrospective chart audit included EHR data collected prior to the education session and for the immediate two months following the education session. Specifically, the collected EHR data evaluated Objectives 2c, 2d, and 2e, which included assessing for an increased number of patients identified meeting eligibility requirements for LCS (patients age 55 to 77 years
greater than or equal to 30 pack-year, current or former smokers with documented smoking cessation within the past 15 years); increased number of documented SDM discussions between primary care providers and patients at high-risk for lung cancer; and increased number of referrals for LDCT or to specialists for LCS in eligible patients. An excel spreadsheet was used to collect the data (Appendix N).

**Data Analysis**

Data analysis of the primary care providers’ pre-, immediate post-, and two-month post-education surveys and retrospective chart audit were analyzed electronically using Qualtrics, Excel, and SPSS. The quantitative data analysis consisted of simple statistical tests with mean scores for Likert scale responses on the surveys. The remainder of the data on the surveys and retrospective chart audit were analyzed with numbers, percentages, frequencies, and statistical tests. A statistician from NDSU was consulted for assistance with the data analysis and descriptive statistics.
CHAPTER FOUR. RESULTS

Presentation of Results

Education sessions were presented during the Redfield Clinic medical staff meeting on November 20, 2019 and the AMC staff meeting on November 27, 2019. The education sessions were open to all clinic staff. Data were collected using pre-, immediate post-, and two-month post-education surveys, and retrospective chart audit.

The co-investigator was granted access to the EHR on January 21, January 24, and January 28, 2020 for the purpose of data collection. No patient identifiers were collected, and the clinic provided reports remained at the clinic. The electronic spreadsheets were password protected on the co-investigator’s laptop.

Demographics

Demographic data were collected on the pre-, immediate post-, and two-month post-education survey. The total number of participants for the education sessions was 28 between the two sites. Eight primary care providers attended the education sessions and were invited to complete the surveys (Table 2).

_____________________________________

1 The material in this chapter was co-authored by Teresa Formo and Dr. Kelly Buettner-Schmidt. Teresa Formo had primary responsibility for collecting samples in the field and for interviewing users of the test system. Teresa Formo was the primary developer of the conclusions that are advanced here. Teresa Formo also drafted and revised all versions of this chapter. Dr. Kelly Buettner-Schmidt served as proofreader and checked the math in the statistical analysis conducted by Teresa Formo.
Table 2

Demographics of Survey Responders

<table>
<thead>
<tr>
<th>Profession</th>
<th>Pre- &amp; Immediate Post-Ed</th>
<th>Two-month Post-Ed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5 63%</td>
<td>n = 3 60%</td>
</tr>
<tr>
<td>Physician</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>2 40</td>
<td>1 33</td>
</tr>
<tr>
<td>Nurse Practitioner</td>
<td>3 60</td>
<td>2 67</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years in Clinical Practice</th>
<th>Pre- &amp; Immediate Post-Ed</th>
<th>Two-month Post-Ed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5 63%</td>
<td>n = 3 60%</td>
</tr>
<tr>
<td>0 - 3 years</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4 - 6 years</td>
<td>3 60</td>
<td>2 67</td>
</tr>
<tr>
<td>7 - 9 years</td>
<td>1 20</td>
<td>0</td>
</tr>
<tr>
<td>10 - 12 years</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Greater than 12 years</td>
<td>1 20</td>
<td>1 33</td>
</tr>
</tbody>
</table>

Ed. = education

Of the eight primary care providers in attendance, five (63%) completed the pre-, and immediate post-education surveys. The majority of the participants (n = 3) were nurse practitioners, the remaining participants (n = 2) were physician assistants. Of the five providers completing the pre- and immediate post-education surveys, three (60%) completed the two-month post-education survey. The majority completing the two-month survey were nurse practitioners (n = 2). The level of experience ranged from 4 to greater than 12 years.

Objective One

The first objective was to develop and implement an educational intervention consisting of LCS education session and LCS toolkit, regarding LCS and the CMS required SDM discussion elements to improve the use of published LCS guidelines by providers. See Table 3 for activities conducted in relation to development and implementation of the intervention.
Table 3

Objective One Activities, and Evaluation

<table>
<thead>
<tr>
<th>Objective</th>
<th>Activities</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop and implement an educational intervention consisting of an education session and toolkit regarding lung cancer screening and the required shared decision-making discussion elements to improve access to and use of published lung cancer screening evidenced based practice by providers.</td>
<td>• Conducted a literature review&lt;br&gt;• Developed education session using PowerPoint presentation.&lt;br&gt;• Developed LCS toolkit with educational resources.&lt;br&gt;• Implemented LCS educational intervention consisting of PowerPoint and LCS toolkit to providers at two rural clinics on 11/20/2019 and 11/27/2019.</td>
</tr>
</tbody>
</table>

LCS = lung cancer screening.

The LCS education evaluation was collected immediately following the education session at both clinics. A total of five evaluations were returned (Table 4).

Table 4

Survey Results LCS Education Evaluation

<table>
<thead>
<tr>
<th></th>
<th>n = 5</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education presentation objectives were met</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Content met educational needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Content beneficial to practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Content easy to understand and free of bias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

LCS = lung cancer screening.
All the participants (100%) reported that the education session met the stated objectives and met the educational needs of the provider, having indicated “strongly agree” on the evaluation. Of the participants, 80% selected “strongly agree” that the content was beneficial to their practice. The remaining participant (20%) selected “neutral”. All the participants indicated that the education was easy to understand and free of bias, by selecting “strongly agree”. Qualitative data included the comments “very informative”, “kept my attention, presented well”, and “nice job”.

The LCS toolkit evaluation was collected two-months after the education session at both sites. Three toolkit evaluations were completed and returned (Table 5).

Table 5

<table>
<thead>
<tr>
<th>Survey Results LCS Toolkit Evaluation</th>
<th>n = 3</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content met educational needs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Content beneficial to practice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Content easy to understand and free of bias</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly agree</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

LCS = lung cancer screening.
The majority of the participants (67%) selected “strongly agree” that the content of the toolkit met their educational needs and that the toolkit was beneficial to their practice. The remaining participant (33%) selected “somewhat agree”. All the participants (100%) indicated that they “strongly agree” that the content was easy to understand and free from bias. Comments included “could use a patient checklist sheet to assess qualifications”.

**Objective Two**

The second objective for the project was to determine the impact of the intervention and was divided into five sub-objectives. As previously discussed, data for this objective were collected using pre-, immediate post-, and two-month post-education surveys and retrospective chart audit. See Table 6 for objective two activities and evaluation.

**Table 6**

**Objective Two Activities and Evaluation**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>Assess for an increase in knowledge of rural primary care providers regarding lung cancer screening guidelines, including shared decision-making discussions.</td>
<td>• Education session for providers regarding LCS with LDCT and LCS guidelines conducted on 11/20/2019 and 11/27/2019.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Each clinic received three LCS toolkit with educational resources for providers and staff on 11/20/2019 and 11/27/2019.</td>
</tr>
<tr>
<td>Objectives</td>
<td>Activities</td>
<td>Evaluation</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>2b Assess for an increase in the confidence of rural primary care providers in initiating shared decision-making discussions with eligible patients at high-risk for lung cancer.</td>
<td>• Education session for providers regarding the identification of patients at high-risk for lung cancer and the importance of SDM discussions, including required elements with patients at high risk for lung cancer conducted on 11/20/2019 and 11/27/2019.</td>
<td>• Collected provider completed pre- and immediate post-education survey on 11/20/2019 and 11/27/2019; and two-month post-education surveys on 01/20/2020 and 01/24/2020 to evaluate perceived confidence in initiating SDM (question 1).</td>
</tr>
<tr>
<td>2c Assess for an increase in the number of patients identified at high-risk for lung cancer and eligible for lung cancer screening by rural primary care providers.</td>
<td>• Education session for providers regarding the identification of patients at high-risk for lung cancer and eligible for screening conducted on 11/20/2019 and 11/27/2019.</td>
<td>• Retrospective Chart Audit: Collected EHR data for the number of patients identified as eligible for LCS (patients age 55 to 77 years, greater than or equal to 30 pack-year smoking history, current or former smokers with smoking cessation within the past 15 years) at both clinics. Redfield: Data collected on 01/20/2020 and 01/28/2020 for the time periods of 06/01/2019 through 07/31/2019 and 11/21/2019 through 01/20/2020. AMC: Data collected on 01/24/2020 for the time periods of 06/01/2019 through 07/31/2019 and 11/27/2019 through 01/24/2020.</td>
</tr>
<tr>
<td>2d Assess for an increase in the number of shared decision-making discussions, inclusive of all required elements, initiated between rural primary care providers and patients at high-risk for lung cancer.</td>
<td>• Education session for providers regarding the importance of an SDM discussions, including required elements with patients at high risk for lung cancer conducted on 11/20/2019 and 11/27/2019.</td>
<td>• Retrospective Chart Audit: Collected EHR data for the number of documented SDM discussions, inclusive of all required elements, between rural primary care providers and patients at high-risk for lung cancer at both clinics. Redfield: Data collected on 01/20/2020 and 01/28/2020 for the time periods of 06/01/2019 through 07/31/2019 and 11/21/2019 through 01/20/2020. AMC: Data collected on 01/24/2020 for the time periods of 06/01/2019 through 07/31/2019 and 11/27/2019 through 01/24/2020.</td>
</tr>
</tbody>
</table>
Table 6. Objective 2 Activities and Evaluation (continued)

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2e</td>
<td>Assess for an increase in the number of referrals for LDCT or to specialists for lung cancer screening in eligible high-risk patients by rural primary care providers.</td>
<td>• Education session for providers regarding the importance of LCS guidelines and LDCT or specialist referral of eligible patients at high-risk for lung cancer conducted on 11/20/2019 and 11/27/2019.</td>
</tr>
</tbody>
</table>

LCS = lung cancer screening. LDCT = low-dose computed tomography. CMS = Centers for Medicare and Medicaid Services. SDM = shared decision-making. EHR = electronic health record. AMC = Ashley Medical Center.

Objective 2a

Objective 2a assessed for an increase in the knowledge of rural primary care providers regarding LCS guidelines and the related CMS requirements for LCS and SDM discussions.

Knowledge of LCS guidelines. Knowledge of USPSTF guidelines and CMS criteria for LCS was assessed through six multiple-choice items adapted from Lewis et al. (2019) survey. Knowledge was divided into high LCS and low LCS knowledge and as a continuous variable, measuring most LCS knowledge to least LCS knowledge. The following items were assessed:

- Q4: Age patients are eligible to begin LCS with LDCT (correct answer: 55)
- Q5: Age patients are no longer eligible for LCS with LDCT (correct answer: either 77 or 80)
- Q6: Minimum smoking exposure in pack years (correct answer: 30 pack-years)
- Q7: Smoking status (correct answer: current and former smokers)
- Q8: LDCT screening for patients not surgical candidates (correct answer: no)
• Q9: LDCT screening frequency (correct answer: 1 year)

Refer to Table 7 for Survey Results of LCS Knowledge.

Table 7

Survey Results of LCS Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ed. n = 5</th>
<th>%</th>
<th>Immediate Post-Ed. n = 5</th>
<th>%</th>
<th>Two-month Post-Ed. n = 3</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4: Age (in years) patients are eligible to begin LCS with LDCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>45</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>3</td>
<td>60</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>55*</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>100</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>65</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Q5: Age (in years) patients are no longer eligible for LCS with LDCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>70</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>77*</td>
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<td>40</td>
<td>4</td>
<td>80</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>78</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>79</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80*</td>
<td>2</td>
<td>40</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>81</td>
<td>1</td>
<td>20</td>
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<td>0</td>
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<td>Other</td>
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<td>0</td>
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<tr>
<td>No Upper Age</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Q6: Minimum smoking exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 pack years</td>
<td>2</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20 pack years</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30 pack years*</td>
<td>2</td>
<td>40</td>
<td>5</td>
<td>100</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>40 pack years</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>50 pack years</td>
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</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 7. Survey Results of LCS Knowledge (continued)

<table>
<thead>
<tr>
<th>Q7: Smoking Status</th>
<th>Pre-Ed.</th>
<th>Immediate Post-Ed.</th>
<th>Two-month Post-Ed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
</tr>
<tr>
<td>Current smokers only</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Former smokers only</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Both current and former smokers*</td>
<td>5</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Q8: LCS with LDCT for patients not surgical candidates

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ed.</th>
<th>Immediate Post-Ed.</th>
<th>Two-month Post-Ed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>No*</td>
<td>2</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Q9: Recommended frequency for LCS with LDCT

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ed.</th>
<th>Immediate Post-Ed.</th>
<th>Two-month Post-Ed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
</tr>
<tr>
<td>1 year*</td>
<td>2</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>2 years</td>
<td>2</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>4 years</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5 years</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10 years</td>
<td>1</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*correct answer(s). LCS = lung cancer screening. Ed. = education. LDCT = low-dose computed tomography. Pack years = number of packs/day x years smoked. 1 pack = 20 cigarettes.

**High versus low knowledge.** High LCS guideline knowledge was defined as the correctly identifying the three major criteria associated with eligible LCS candidates: initial age of LCS eligibility, minimum smoking exposure and smoking status (questions four, six and seven). Low LCS knowledge was defined as not correctly identifying the three major criteria. See Table 8 for the results.

Table 8

Survey Results of High Knowledge Versus Low Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ed.</th>
<th>Immediate Post-Ed.</th>
<th>Two-month Post-Ed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
</tr>
<tr>
<td>High Knowledge</td>
<td>1</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Low Knowledge</td>
<td>4</td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>

Ed. = education
Prior to the education session, only 20% (n = 1) met the definition for high knowledge of LCS, with the majority, 80% (n = 4), defined as having low knowledge of LCS. All the participants (100%) were defined as having high knowledge of LCS on the immediate post- and two-month post-education surveys.

**Most versus least knowledge.** Knowledge of LCS guidelines was redefined as a continuous variable based on correct answers to all six items, with the least knowledge having zero correct and the most knowledge having all six items correct. See Table 9 for results.

Table 9

<table>
<thead>
<tr>
<th>Survey Results of Most Knowledge to Least Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Correct Items</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

Ed. = education. Most knowledge is associated with most correct items.

Prior to the education session, all the participants answered four or less items correctly. Immediately post-education, the majority, 80% (n = 4), answered six of six items correctly. Two-months post-education 67% (n = 2) of participants answered five or six of six items and 33% (n = 1) of participants answered three items correctly.

**Knowledge of CMS requirements.** Knowledge related to CMS requirements for LCS and SDM was assessed through questions two and three (Table 10).
## Table 10

**Survey Results of Knowledge of CMS Requirements for LCS and SDM**

<table>
<thead>
<tr>
<th>Q2: Elements required for CMS reimbursement for SDM (multiple answers possible)</th>
<th>Pre-Ed. n = 5</th>
<th>Immediate Post-Ed. n = 5</th>
<th>Two-month Post-Ed. n = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits of screening*</td>
<td>4 80</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Harms of screening*</td>
<td>1 20</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>False positives*</td>
<td>0</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Follow-up testing*</td>
<td>2 40</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Overdiagnosis*</td>
<td>0</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Total radiation exposure*</td>
<td>2 40</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Adherence to annual screening*</td>
<td>2 40</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Impact of comorbidities*</td>
<td>1 20</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Ability/willingness to undergo diagnosis and treatment*</td>
<td>1 20</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Maintaining cigarette smoking abstinence if former smoker*</td>
<td>2 40</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Importance of smoking cessation if current smoker*</td>
<td>2 40</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1 20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q3: Required SDM documented by CMS (multiple answers possible)</th>
<th>Pre-Ed. n = 5</th>
<th>Immediate Post-Ed. n = 5</th>
<th>Two-month Post-Ed. n = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOB / Age*</td>
<td>4 80</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Pack-years smoking history*</td>
<td>5 100</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Smoking status*</td>
<td>5 100</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Number of years since quitting*</td>
<td>5 100</td>
<td>5 100</td>
<td>3 100</td>
</tr>
<tr>
<td>Statement no lung cancer signs or symptoms*</td>
<td>1 20</td>
<td>5 100</td>
<td>2 67</td>
</tr>
<tr>
<td>Statement no lung cancer family history</td>
<td>1 20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Don’t know</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Correct answers. CMS = Centers for Medicare and Medicaid Services. Ed. = education. SDM = shared decision-making. Pack years = number of packs/day x years smoked. 1 pack = 20 cigarettes.
For question two, participants were asked to select all applicable SDM elements required by CMS. Of the 13 items, 11 responses were correct. Incorrect responses included “other” and “don’t know” (See Table 11).

Table 11

Survey Results of the Number of Correctly Identified SDM Elements Required by CMS

<table>
<thead>
<tr>
<th># Correct Items</th>
<th>Pre-Ed. n = 5</th>
<th>%</th>
<th>Immediate Post-Ed. n = 5</th>
<th>%</th>
<th>Two-month Post-Ed. n = 3</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>0</td>
<td>%</td>
<td>5</td>
<td>100</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>40</td>
<td>0</td>
<td></td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>%</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td></td>
<td>0</td>
<td>%</td>
</tr>
</tbody>
</table>

CMS = Centers for Medicaid and Medicare Services. SDM = shared decision-making. Ed. = education.

Prior to the education, no participants correctly selected all eleven elements, 40% (n = 2) of participants correctly selected six of the eleven elements, 20% (n = 1) correctly selected four elements, 20% (n = 1) correctly selected one element and 20% (n = 1) did not select any correct elements. Immediate post-education found 100% (n = 5) of participants correctly selected all eleven elements. Two-months post-education, 67% (n = 2) of participants correctly selected all eleven elements with the remaining participants, 33% (n = 1), correctly selecting six of eleven elements.

For question three, participants were asked to select all the statements needed for SDM documentation for CMS payment of LCS with LDCT. Of the eight items, five of the responses
were correct statements. Incorrect responses included “statement that the patient does not have a family history of lung cancer”, “other”, and “don’t know” (Table 12).

Table 12

**Survey Results for Knowledge of SDM Documentation for LCS with LDCT**

<table>
<thead>
<tr>
<th># Correct Items</th>
<th>Pre-Ed.</th>
<th>Immediate Post-Ed.</th>
<th>Two-month Post-Ed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

SDM = shared decision-making. Ed. = education.

Prior to education, the majority of the participants (60%) correctly selected four of the five statements with 20% of participants correctly selecting all five correct statements.

Immediate post-education found 100% (n = 5) of participants correctly selecting all five statements. Two-months post-education, the majority of participants, 67% (n = 2), correctly selected all five statements with the remaining participants correctly selecting four of five statements.

**Objective 2b**

Objective 2b assessed for an increase in the confidence of rural primary care providers initiating share decision-making discussions (question one). Table 13 presents the results.
Table 13

Survey Results of Provider Confidence

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ed.</th>
<th></th>
<th>Immediate Post-Ed.</th>
<th></th>
<th>Two-month Post-Ed.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 5</td>
<td>%</td>
<td>n = 5</td>
<td>%</td>
<td>n = 3</td>
<td>%</td>
</tr>
<tr>
<td><strong>Q1: Confidence in initiating SDM discussion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very confident</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat confident</td>
<td>4</td>
<td>80</td>
<td>4</td>
<td>80</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Not at all confident</td>
<td>1</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Ed. = education. SDM = shared decision-making.

Prior to the education session, the majority of the participants, 80% (n = 4), reported being somewhat confident in initiating SDM discussions, with confidence increasing immediately post-education, and then declining somewhat two months post-education. However, from pre-education to two months post-education, confidence did increase.

Responses to question one was ranked with 1 = “not at all confident”, 2 = “somewhat confident”, and 3 = “very confident”. The mean score of the surveys were calculated and a paired samples t-test was used to compare the mean pre-education confidence level to the immediate post-education confidence level. The mean score of the pre-education survey (n = 5) was 1.80 (sd = .45) and the mean score of the immediate post-education survey (n=5) was 2.20 (sd = .45). No significant difference from pre- to immediate post-education was found (t (4) = -1.633, p>.05). Due to lower response, the two-month post-education confidence level was not included.

**Objective 2c**

Objective 2c assessed for an increase number of patients identified at high-risk for lung cancer and eligible for LCS by rural primary care providers. Data for this objective were collected by retrospective chart audit previously discussed. Eligibility for LCS requires documentation of age (55 - 77), smoking status, quit date, and pack years.
Redfield. Redfield Clinic provided the co-investigator with a report of patients seen in the clinic during the pre-education period, June 2019 through July 2019, and the post-education period, November 20, 2019 through January 20, 2019. The report was filtered for ages 55 through 80 years and included smoking status of current, former, or unknown. A total of 249 patient records (age 55 - 77) were reviewed for the pre-education period and 236 patient records (age 55 - 77) were reviewed for the post-education period (See Table 14).

Table 14

Results of Eligibility Documentation – Redfield

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>Pre-Education (n = 249)</th>
<th>Post-Education (n = 236)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Quit Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quit Date ≤ 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years Documented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pack Years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Documented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pack Years ≥ 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years Documented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>167</td>
<td>67</td>
</tr>
<tr>
<td>Current smokers</td>
<td>81</td>
<td>33</td>
</tr>
<tr>
<td>Not documented</td>
<td>1</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

LCS = lung cancer screening. Pack years = number of packs/day x years smoked. 1 pack = 20 cigarettes.

Patient age was documented on all the records. Of the reviewed records two-thirds were former smokers and one-third were current smokers, with less than 1% not having smoking status documented. Prior to the education pack-years was documented in only 6% of the records with an increase to 17% post-education. Quit date was documented in less than half of former smoker records.

To determine LCS eligibility, documentation for patients age 55 – 77 was reviewed for a quit date equal or less than 15 years for former smokers, and for pack years equal or greater than 30 years for current and former smokers (Table 15).
Table 15

Results of LCS Eligibility – Redfield

<table>
<thead>
<tr>
<th></th>
<th>LCS Eligible</th>
<th>Not Eligible</th>
<th>Unable to Determine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Pre-Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former Smoker</td>
<td>249</td>
<td>4</td>
<td>2*</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>167</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Not documented</td>
<td>81</td>
<td>3</td>
<td>4*</td>
</tr>
<tr>
<td><strong>Post-Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former Smoker</td>
<td>236</td>
<td>17</td>
<td>7*</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>157</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Not documented</td>
<td>77</td>
<td>13</td>
<td>17*</td>
</tr>
</tbody>
</table>

LCS = lung cancer screening.

* Percentages differ significantly for eligible for LCS, current smokers eligible for LCS, and unable to determine, \( p < .05 \)

Based upon the pre-education documentation for former smokers, less than <1% (n = 1) were eligible for LCS. Of the pre-education records reviewed for current smokers 4% (n = 3) were eligible for LCS. Post-education documentation found 3% (n = 4) of former smokers and 17% (n = 13) of current smokers eligible for LCS. Of note is the high percentage of patients lacking documentation to determine eligibility. For the records reviewed, 82% (n = 205) of pre-education and 73% (n = 172) of post-education, the documentation was insufficient to determine LCS eligibility.

A two-sample t-test was performed to determine whether there was a significant difference between the pre- and post-education percentages for patients in which LCS eligibility was unable to be determined, between the pre- and post-education percentages for patients eligible for LCS, and between the pre- and post-education percentages for current smokers eligible for LCS. The decrease in the percentage of patients (pre- to post-education) in which LCS was unable to be determined, was significant at the 0.5 alpha level \( t(483) = 2.377, p = .0178 \). Likewise, the increase in the percentage of patients found to be eligible for LCS was
significant at the 0.5 alpha level $t(483) = 2.674, p = .0078$ and the increase in the percentage of current smokers found to be eligible for LCS was significant at the 0.5 alpha level $t(156) = 2.683, p = .0081$.

**AMC.** AMC provided the co-investigator with a report of patients seen in the clinic during the pre-education period, June 2019 through July 2019, and the post-intervention period, November 27, 2019 through January 24, 2019. The report was filtered for ages 55 through 80 years. A total of 174 patient records (age 55 - 77) were reviewed for the pre-education period and 172 patient records (age 55 - 77) were reviewed for the post-education period. Patient age was documented on all the records. Of the reviewed records, 57% (n = 100) of the pre-education and 55% (n = 95) of the post-education records, were excluded for status of “never smoker”. Of the remaining records, nearly two-thirds were former smokers and just over one-third were current smokers or did not have a smoking status documented (Table 16).

Table 16

*Results of Eligibility Documentation – AMC*

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>n</th>
<th>%</th>
<th>Quit Date Documented</th>
<th>Quit Date ≤ 15 Years</th>
<th>Pack Years Documented</th>
<th>Pack Years ≥ 30 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Education (n = 75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>48</td>
<td>64</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Current smokers</td>
<td>14</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not documented</td>
<td>12</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Education (n = 77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>53</td>
<td>68</td>
<td>10</td>
<td>19</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Current smokers</td>
<td>16</td>
<td>21</td>
<td></td>
<td></td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Not documented</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LCS = lung cancer screening. AMC = Ashley Medical Center. Pack years = number of packs/day x years smoked. 1 pack = 20 cigarettes.
An increase of 6% in smoking status documentation was found from pre- to post-education. Pack years were documented in 31% of the records post-education. Prior to education, quit date was documented in 8% of former smokers with an increase to 19% post education.

To determine LCS eligibility, documentation for patients age 55 -77 was reviewed for a quit date equal or less than 15 years for former smoker and for pack years equal or greater than 30 years for current and former smokers (Table 17).

Table 17

Results of LCS Eligibility – AMC

<table>
<thead>
<tr>
<th></th>
<th>LCS Eligible</th>
<th>Not Eligible</th>
<th>Unable to Determine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Pre-Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former Smoker</td>
<td>48</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>14</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>Not documented</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smoker</td>
<td>53</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>16</td>
<td>7</td>
<td>44</td>
</tr>
<tr>
<td>Not documented</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LCS = lung cancer screening. AMC = Ashley Medical Center.

Based upon the documentation no former smokers were eligible for LCS screening, either pre- or post-education. A 15% increase in current smokers eligible for LCS was noted from pre- to post-education. Records containing insufficient documentation to determine LCS eligibility decreased from 69% (n = 51) pre-education to 62% (n = 48) post-education.

A two-sample t-test was performed to determine whether there was a significant difference between the pre- and post-education percentages for patients in which LCS eligibility was unable to be determined, between the pre- and post-education percentages for patients eligible for LCS, and between the pre- and post-education percentages for current smokers eligible for LCS. The decrease of pre- to post-education patients in which LCS eligibility was
unable to be determined was not significant at the 0.5 alpha level, \( t(149) = 0.904, p = .3674 \).
Likewise, the increase in the patients found to be eligible for LCS was not significant at the 0.5 alpha level, \( t(149) = 0.961, p = .3383 \) and the increase in the percentage of current smokers found to eligible for LCS was not significant at the 0.5 alpha level \( t(28) = 0.849, p = .4031 \).

**Objective 2d**

Objective 2d assessed for an increase number of SDM discussion initiated between rural primary care providers and patients identified at high-risk for lung cancer. Data for this objective were collected by retrospective chart audit as previously discussed. After identifying patients that meet criteria for LCS eligibility and before LCS with LDCT, SDM discussion is required. Components of the SDM discussion have been previously discussed.

**Redfield.** Results of chart audit for documented SDM discussion for LCS eligible patients for pre-education period, June 2019 through July 2019, and post-education period of November 20, 2019 through January 20, 2019 are found in Table 18.

Table 18

*Results of Documented SDM – Redfield*

<table>
<thead>
<tr>
<th></th>
<th>Pre-Education</th>
<th></th>
<th></th>
<th>Post-Education</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Former smokers</td>
<td>249</td>
<td>4</td>
<td>2</td>
<td>167</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Current smokers</td>
<td>81</td>
<td></td>
<td>75</td>
<td></td>
<td>10</td>
<td>59</td>
</tr>
<tr>
<td>Excluded for CT in past 12 months</td>
<td>4</td>
<td></td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SDM = shared decision-making. LCS = lung cancer screening.

Of the patient records (age 55 - 77) reviewed, only 2% (n = 4) pre-education and 7% (n = 17) post-education were eligible for LCS based upon documentation in the record. Current
smokers accounted for three-quarters of the eligible patients pre-education and over half of the eligible patients post-education. None of the eligible patients (former or current) had documentation supporting SDM pre-education. Post-education, of the 17 patients identified as eligible for LCS, 29% had a documented SDM discussion that included all the CMS required elements. In addition, all the former smokers had SDM documentation. Nearly a quarter (23%) of the LCS eligible patients post-education was excluded for LCS due to documentation of a diagnostic CT during the previous 12 months.

A two-sample t-test was performed to determine whether there was a significant difference between the pre- and post-education percentages for SDM documentation. The increase of pre- to post-education patients in which LCS was unable to be determined was not significant at the 0.5 alpha level, $t(149) = 0.904, p=.3674$. Likewise, the increase in the patients found to be eligible for LCS was not significant at the 0.5 alpha level, $t(149) = 0.961, p=.3383$.

**AMC.** Results of chart audit for documented SDM discussion for LCS eligible patients for pre-education period, June 2019 through July 2019, and post-education period of November 27, 2019 through January 24, 2019 are found in Table 19.

Table 19

*Results of Documented SDM – AMC*

<table>
<thead>
<tr>
<th></th>
<th>Patients eligible for LCS</th>
<th>Documented SDM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td><strong>Pre-Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td><strong>Post-Education</strong></td>
<td>77</td>
<td>7</td>
</tr>
<tr>
<td>Former smokers</td>
<td>53</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>Excluded for lung cancer</td>
<td>1</td>
<td>14</td>
</tr>
</tbody>
</table>

SDM = shared decision-making. AMC = Ashley Medical Center. LCS = lung cancer screening.
Of the patient records (ages 55 - 77) reviewed, only 5% (n = 4) pre-education and 9% (n = 7) post-education were eligible for LCS based upon documentation in the record. Current smokers made up all the documented eligible patients in both the pre- and post-education period. None of the eligible patients had documentation supporting SDM for both pre- and post-education period. Post-education 14% (n = 1) of the eligible patients were excluded for documentation of a lung cancer diagnosis.

**Objective 2e**

Objective 2e assessed for an increase number of referrals for LDCT or to specialists for LCS in eligible patients at high-risk for lung cancer. Data for this objective were collected by retrospective chart audit as previously discussed. After determining eligibility and following SDM discussion in which the patient and provider decide to proceed with LCS, the next step is to place a referral for LDCT or to a specialist.

**Redfield.** Results of chart audit for documented LDCT or a specialist referral for LCS eligible patients with documented SDM discussions for pre-education period, June 2019 through July 2019, and post-education period of November 20, 2019 through January 20, 2019 are found in Table 20.

Table 20

*Results of LDCT or Specialist Referral – Redfield*

<table>
<thead>
<tr>
<th>Documented SDM</th>
<th>LDCT / Specialist Referral</th>
<th>Decision pending</th>
<th>Not documented</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Pre-Intervention (n = 0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Post-Intervention (n = 5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>1</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

LDCT = low-dose computed tomography. SDM = shared decision-making. LDCT = low-dose computed tomography.
Of the pre-education records reviewed, no patients had documentation of SDM discussion, or a LDCT or to specialist referral. Post-education, 60% of the patients with SDM discussion had documentation of either a LDCT or to specialist referral, or documentation indicating the patient was considering their options. The documented LDCT order was documented for a former smoker.

**AMC.** Results of chart audit for documented LDCT or a specialist referral for LCS eligible patients with documented SDM discussions for pre-education period, June 2019 through July 2019, and post-education period of November 27, 2019 through January 24, 2019 are found in Table 21.

<table>
<thead>
<tr>
<th>Table 21</th>
<th>Results of LDCT or Specialist Referral – AMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documented SDM</td>
<td><strong>LDCT / Specialist Referral</strong></td>
</tr>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td><strong>Pre-Intervention (n = 0)</strong></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>0</td>
</tr>
<tr>
<td><strong>Post-Intervention (n = 0)</strong></td>
<td></td>
</tr>
<tr>
<td>Former smokers</td>
<td>0</td>
</tr>
<tr>
<td>Current smokers</td>
<td>0</td>
</tr>
</tbody>
</table>

LDCT = low-dose computed tomography. AMC = Ashley Medical Center. SDM = shared decision-making.

Of the records reviewed both pre- and post-education, no patients had documentation of a SDM discussion, or a LDCT or specialist referral.
CHAPTER FIVE. DISCUSSION AND RECOMMENDATIONS

Interpretation of Results

The purposes of this practice improvement project were (a) to increase the knowledge of rural primary care providers regarding LCS guidelines and the related CMS requirements and to increase their confidence in initiating SDM discussions through the development and implementation of LCS education and (b) to determine the impact of the project. The project included the development and implementation of an educational intervention, consisting of an education session and toolkit, regarding LCS guidelines, related CMS requirements and SDM. Implementation occurred over two-months. The impact of the intervention was evaluated through pre-, immediate post-, and two-month post-education surveys and retrospective chart audit. The results of the project indicated an increase in provider knowledge of LCS guidelines and CMS requirements. In addition, both sites demonstrated a small increase in the number of patients eligible for LCS based on documentation in the EHR.

Objective One

The first objective was to develop and implement an educational intervention consisting of LCS education session and LCS toolkit, regarding LCS and the CMS required SDM discussion elements to improve the use of published LCS guidelines by providers. This objective was evaluated through the use of a five-point Likert scale on the LCS education and toolkit evaluation. All participants strongly agreed that the objectives of the education presentation were met and either strongly agreed or somewhat agreed that the content of the LCS education presentation and toolkit met educational needs, was easy to understand, and free of bias. The majority (88%) of participants strongly agreed or agreed that the content of the LCS education presentation and toolkit content was beneficial to practice. From these results a conclusion can
be reasonably made that as the participating providers at Redfield and AMC reported a benefit of the educational intervention to practice, objective one, to improve use of the published guidelines, was met.

**Objective Two**

The second objective was to determine the impact of the educational intervention and was divided into five sub-objectives. The objective was evaluated with pre-, immediate post-, and post-education surveys and retrospective chart audit. Caution is exercised in determining inferences from the results of the pre-, immediate post-, and two-month post-education surveys due to the small, purposive sample with low response rate. Of the eight potential responders, five completed the pre- and immediate post-education surveys, with three of the five completing the two-month post-education survey.

**Objective 2a**

Objective 2a assessed for an increase in the knowledge of rural primary care providers regarding LCS guidelines and the related CMS requirements for LCS and SDM discussions. All participants were defined as having high knowledge of LCS as measured by correctly answering questions four, six and seven on the immediate post- and two-month post-education survey in comparison to 20% of the participants prior to the educational intervention.

In addition, knowledge was measured as a continuous variable, with least knowledge having zero correct and the most knowledge having all six items correct. The most knowledge was found immediate post-education with 100% of participants correctly answering five (20%) or six (80%) of the six items correctly. Prior to the educational intervention, all participants answered four (40%) or less items correctly. The two-month post-education survey found the majority of participants (66%) answering five (33%) and six (33%) of the six items correctly with the remaining participants (34%) answering four items correctly. This is more than the pre-
education but slightly less than immediate post-education. Thus, an increase in knowledge of LCS guidelines was found following the educational intervention. Similar to Lewis et al. (2019), this study initially found a low level of LCS knowledge by providers. This study showed an increase of LCS knowledge following education.

Similar results were noted related to knowledge of CMS requirements for LCS and SDM. Prior to the educational intervention none of the participants correctly identified the CMS requirements for LCS and SDM. The most correct responses were identified immediately post-education with all participants (n = 5) correctly identifying the CMS requirements for LCS and SDM. A slight decrease was noted in the two-month post education with 2 of the 3 participants correctly identifying the CMS requirements for LCS and SDM. Thus, the most knowledge for LCS and SDM was found immediately post-education. A conclusion can be made that the knowledge of LCS guidelines and the related CMS requirements for LCS and SDM discussions increased and was at a high level of knowledge following the educational intervention, thus, Objective 2a was met.

**Objective 2b**

Objective 2b assessed for an increase in confidence in initiating SDM discussions following the educational intervention. This objective was evaluated through the use of a three-point Likert scale. An increase in confidence was noted from pre-education to immediate post-education, however, the increase was not significant.

Research regarding SDM discussion for LCS have reported variable use (Carter-Harris et al., 2016; Lowenstein et al., 2019). Carter-Harris et al. (2016), reported SDM discussion in less than 20% of screening-eligible current and former smokers, with provider education listed as “crucial in order to enhance patient-provider discussions” (Discussion section, para. 3). In
addition, Lowenstein et al. (2019), found that physicians reported a more thorough SDM discussions than was perceived by patients. Likewise, Detterbeck et al. (2013) identified a lack of awareness and knowledge of LCS guidelines as adding to the challenges of SDM. These studies illustrate the importance of provider education to increasing SDM discussions. Although not statistically significant, this study did find that education increased confidence in initiating SDM.

**Objective 2c**

Objective 2c assessed for an increase in the number of patients identified at high risk for lung cancer and eligible for LCS. At Redfield, from pre-education to post-education, the percent of charts reviewed that did not have enough documentation to determine eligibility decreased from 82% to 73%, demonstrating a significant decrease. Of the charts with enough documentation, those eligible for LCS increased from 2% to 7%, demonstrating a significant increase.

Similar to Redfield, AMC, from pre-education to post-education, found that the percent of charts reviewed that did not have enough documentation to determine eligibility decreased from 69% to 62%, although not statistically significant, this decrease was clinically significant. Of the charts with enough documentation, those eligible for LCS increased from 5% to 9%. Again, this was not a statistically significant increase, it was clinically significant.

For both Redfield and AMC, from pre-education to post-education, the percent of charts reviewed identifying current smokers as eligible for LCS increased. Redfield demonstrated a significant increase from 4% to 17%. For AMC, the increase of 29% to 44% of current smokers identified as eligible for LCS was not significant.
Results for AMC indicate that there was not enough evidence to conclude that the difference was significant. One assumption is the smaller sample size at AMC compared to Redfield. Larger samples provide more information about a population, thus by increasing the sample size the power of the statistical test is increased (Interpret the key results for 2 proportions, n.d.).

Kinsinger et al. (2017) noted that 39% of patients were unable to be screened due to inconsistent or lack of quit date and pack year documentation. In this study, both sites showed a decrease in the percentage of patients lacking documentation to determine eligibility and an increase in the percentage of patients determined as eligible for LCS; with significant changes in the Redfield Clinic.

The most important part of a screening program is the identification of individuals who will benefit the most from the screening interventions and experience the least amount of harm. Although this project demonstrated an increase in the identification of patients eligible for LCS, of note should be the missed opportunities for identification of eligible patients related to inconsistent or missing documentation. Post-education 73 % (n =172) of patients at Redfield and 62% (n = 48) of patients at AMC were missing key documentation to determine eligibility. This finding is similar to the VHA study that recognized identifying patients eligible for LCS as a significant challenge to the implementation of LCS (Kinsinger et al., 2017).

A conclusion can be made that this objective was met by both sites demonstrating a decrease in the percentage of patients in which eligibility was not able to be determined, as well as an increase in the percentage of patients identified as eligible for LCS.
**Objective 2d**

Objective 2d assessed for an increase in the number of SDM discussions initiated between rural primary care providers and patients at high-risk for lung cancer. For Redfield, none of the four patients identified as eligible for LCS prior to the educational intervention had a documented SDM discussion. Post-education, 29% of patients identified as eligible for LCS, had a documented SDM discussion and included all the CMS required elements. Interestingly, of the former smokers, all eligible for LCS had a documented SDM discussion. For AMC, no SDM discussions were identified in the pre- or post-education chart audit. A conclusion can be made that for site one this objective was met.

**Objective 2e**

Objective 2e assessed for an increase in the number of referrals for LDCT or to specialists for LCS in eligible high-risk patients. Prior to the intervention, this data were not obtained for either site as there were no patients with documented SDM discussions. Post-educational intervention, at the first site, 20% of the five patients with a documented SDM discussion were referred for LDCT. Of the four patients without a referral, 40% had documentation that the patient was considering their options. For the second site, this data were not obtained as there were no patients with documented SDM discussions for the post educational intervention. A conclusion can be made that for site one this objective was met.

The increase in the percentage of patients noted for this objective was small. This project was similar to the practice improvement project by Cloonan (2017), in that both incorporated a two-month implementation period. The short implementation period was considered to play a part in the lack of improvement in LCS referrals noted by Cloonan (2017) and for the small improvement noted by this co-investigator. In addition, those patients still considering their
options at the time of data collection for this co-investigators project, may eventually agree to the referral.

Taking into account that few patients were documented as eligible for LCS, documentation of even a small number of SDM discussions is a positive finding for this project. The Revised Iowa Model (2017) includes evaluation steps to promote adoption and to reinfuse the project as needed. Implementation of LCS guidelines is a complex process. The results show promise with continued evaluation.

**Results Summary**

This project found that the educational intervention improved provider use of published LCS guidelines and increased provider knowledge of LCS guidelines and the related CMS requirements. Although not a significant change, the educational intervention also increased provider confidence in initiating SDM discussions. In addition, the intervention improved documentation to determine eligibility and increased the percentage of patients identified at high risk for lung cancer and eligible for LCS; with one of the two implementation sites experiencing significant changes. At one intervention site, of those patients identified as eligible for LCS, almost one-third had a documented SDM discussion; this was an increase from no documented SDM discussions for eligible patients prior to the educational intervention. At the same intervention site, of the five patients eligible for referral, one patient was referred for LCDT and two patients were still considering referral.

The positive findings for this project are promising to rural providers. Lewis et al. (2019) found primary care providers lack awareness of recommended guidelines and are apprehensive with ordering LDCT for LCS. Lack of awareness and lack of knowledge of LCS guidelines by rural providers have been noted as a deterrence to SDM (Jenkins et al., 2018). This project
addressed the elements and requirements for SDM and found a clinically, but not statistically significant, increase in provider confidence in initiating SDM, thus emphasizing the importance of education for rural providers. Education provided in the context of this project demonstrated an increase in knowledge and identification of patients eligible for LCS. In addition, system barriers in rural areas, including lack of access to LDCT, leads to decreased LCS (Hoffman et al., 2015). Both sites indicated an increase in the patients identified for LCS, however, only Redfield had documented referral for LDCT following the education. This could be in part that Redfield is performing LDCT on site, while at the time of the project, AMC was not performing the procedure,

**Recommendations**

Results of this project support the need for additional research on the evaluation of provider education on the implementation of LCS guidelines. Research addresses provider perception of LCS guidelines and overall knowledge, however, is limited in the effect of education on the implementation and use of LCS guidelines (Lewis et al, 2019). Implementation of LCS guidelines is a complex process that requires a well thought out organizational process for success. Continued evaluation is recommended to address any future educational and process gaps.

A recommendation for additional education would be to offer education in multiple formats. This would fit into the Adult Learning Theory principles of readiness to learn, prior experience, self-directed learning, and the need to know (Merriam, 2018). Use of an online interactive module with multiple patient scenarios is one format to consider.

Another recommendation is to provide LCS education to patients. Bryne et al. (2019), noted that a thorough understanding of factors affecting patient awareness and knowledge of
LCS is vital in engaging patients in effective SDM discussions. Decision aids are an important tool for facilitating SDM and it would benefit the organizations to personalize decision aids for their patients (Cloonan, 2017).

Implementation of the project at each site provided unique challenges. Recommendations for both sites would be to focus on the consistent documentation of quit date for former smokers, and pack history for current and former smokers. Lung cancer screening is more than a single test, it is complex process that begins with the identification of a population with sufficient risk and low enough competing risks (Detterbeck, 2013). Mazzone et al. (2018), reported on implementation challenges of LCS to include difficulty identifying eligible patients due to incomplete smoking history information and inconsistent use of EHR tools and documentation.

Finally, a recommendation for both sites would be to follow the Iowa Model with continued evaluation, monitoring of key indicators, and re-infusing to hardwire the change into the system (Iowa Model Collaborative, 2017). According to the Iowa Model Collaborative (2017), “hardwiring occurs when evidence-based practice is the default approach, done automatically within the workflow” (p. 180). To improve success, a recommendation is to collaborate with information technology as the majority of data collection for this project was manual abstraction of the chart.

**Limitations**

Several limitations were associated with this practice improvement project. The first limitation was the limited number of education sessions. One education session was held at each site. Limiting the education session to one time at each site, limits the number of participants to the availability at the time of the session. In addition to the limited number of sessions, the education sessions were held as part of another regular scheduled meeting. At both sites the
education was conducted in the first part of the meeting limiting time for discussion and questions. This may have played a part in decreased survey completion, especially for physicians as no physician completed surveys.

Another limitation to this project is sample mortality. In research, mortality refers to participants who have dropped out of the study or did not complete the process (Wright & Lake, n.d.). Sample mortality is common in pre-test/post-test project designs, small samples, and with long periods of time between surveys (Wright & Lake, n.d.), such as this project.

The small sample size can be considered a limitation. Small sample size can negatively impact results by limiting the ability to generalize the results. The Iowa model offsets these limitations by taking into account the intent of the project, which is to improve quality and safety within the local clinical setting by applying evidence, for this project the implementation of LCS guidelines, into practice (University of Iowa Hospitals and Clinics, n.d.). The scope of interest endorsed by the Iowa Model is a specific unit or population within an organization. In the context of rural healthcare, this often leads to small sample sizes.

Consistent documentation in the electronic medical record is another limitation. Each site used a different electronic medical record system with differing capabilities. Understanding the capabilities of the medical record was a limitation of the co-investigator. Documentation regarding SDM and LDCT or specialist referral may have been missed related to the co-investigator’s limited understanding of the EHR and inconsistent documentation in the record.

Aggregating the data resulting from survey results can be considered a limitation. Aggregate form was used to protect provider identities in both sites; however, the aggregation of data does not allow for the results to be tailored to the individual sites or providers. In addition, the aggregate data does not allow for the determination of individual provider knowledge and
LCS referrals. Knowledge of this information would help to follow-up and tailor further education to meet the provider needs. Knowles’ principles identify motivation to learn, readiness to learn, and need to know as characteristics of the adult learner (Merriam, 2018). The ability to provide individual data to providers supports these principles.

Identified as another limitation was the amount of time allotted for data collection and monitoring. The data were collected for a two-month period prior to the start of the educational intervention and again for two months following the intervention. The amount of time may have not been adequate to identify screening patterns prior to the educational intervention. In addition, the amount time following the intervention may not have been adequate to fully see changes. As previously discussed, continued use of the Iowa model to evaluate and re-infuse overtime will help to realize continued improvements.

**Implications for Practice**

This practice improvement project involved two different clinical sites, including physicians, advanced practice providers, nursing staff and clinic support staff. The data collected adds to the available literature regarding the impact of healthcare professional-focused educational interventions. The results of the project support the need for increased use of LCS guidelines and continued evaluation of project objectives. The co-investigator found that knowledge regarding LCS was low prior to the project, with the most knowledge gained immediately after the education session, and remained at a high level even two months post-intervention. Continued educational support is needed as identification of patients eligible for LCS is a complex process involving the nursing staff and providers.

New information was provided during the educational intervention project to increase healthcare professional knowledge about the significance of lung cancers and importance of
early detection through screening. Lung cancer is accountable for more deaths than any other cancer (ACS, 2019a). Improving identification and screening of eligible patients will lead to reduced lung cancer mortality (De Koning et al. 2018).

An important part of the lung cancer screening process is SDM. The small increase in SDM discussions demonstrated in the project is promising. Continued education and evaluation are needed for further increases. In addition, smoking cessation is an important aspect of LCS (Mishra et al, 2016). This project did not specifically address smoking cessation. Documentation of smoking cessation counseling is a requirement of CMS (2015), however was not a focus of this project, yet is an important implication for practice.

**Implications for Future Research**

Additional research is needed in implementation processes of LCS. Specifically, research to improve consistent documentation of quit dates and pack years could improve determination of LCS eligibility of patients. Identification of eligible patients is the first and one of the most important part of the screening process.

Another area of focus for future research is the rural population. Limited research is available for LCS implementation in rural healthcare. Rural areas are often face with limited resources, decreased access, and lack of awareness of recommended guidelines (Jenkins et al., 2018).

**Application to DNP Roles**

Nurse practitioners in primary care and family practice are ideally positioned to screen patients and educate regarding LCS. Nurse practitioners improve the health of the population and provide education to patients. Increased screening and opportunities for prevention through smoking cessation has the potential to improve health and reduce lung cancer mortality.
REFERENCES


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https://doi.org/10.1093/jncics/pkz035


https://doi.org/10.1016/j.prmedr.2015.08.014


### APPENDIX A. LITERATURE REVIEW SEARCH STRATEGY

#### Literature Search Databases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Web of Science</td>
<td>n = 668; n* = 19</td>
<td>n = 36; n* = 6</td>
<td>n = 91; n* = 2; n = 18; n* = 0</td>
</tr>
<tr>
<td>PubMed</td>
<td>n = 954; n* = 42</td>
<td>n = 11; n* = 1</td>
<td>n = 5; n* = 0; n = 5; n* = 0</td>
</tr>
<tr>
<td>MEDLINE</td>
<td>n = 89; n* = 19</td>
<td>n = 10; n* = 1</td>
<td>n = 11; n* = 1; n* = 0</td>
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<td>Cochrane</td>
<td>n = 4; n* = 0</td>
<td>n = 0; n* = 0</td>
<td>n = 1; n* = 0; n* = 0</td>
</tr>
<tr>
<td>Reviews</td>
<td>n = 131; n* = 20</td>
<td>n = 6; n* = 0</td>
<td>n = 23; n* = 7; n* = 6</td>
</tr>
<tr>
<td>Trials</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Limits:** 2013 to April 2019; n* = April 2019 to January 30, 2020

Exclusions applied (non-English, radiology-based studies, observational design, non-smokers, ages other than 55 to 80 years, editorials, and commentaries) and duplicates removed: n = 1585; n* = 100

#### Identification

- Abstracts screened for inclusion (n = 474; n* = 22)
  - Removed (n = 220; n* = 10)
  - Added (n = 13; n* = 0)

#### Screening

- Inclusions (age 55 to 80, lung cancer screening interventions, guidelines, implementation of lung cancer screening in primary care, provider knowledge and SDM)

#### Eligibility

- Full-text articles screened for eligibility (n = 267; n* = 12)
  - Exclusion reasons:
    - Interventions not specific to lung cancer screening (n = 146; n* = 6)
    - Inappropriate population (n = 40; n* = 1)
    - Interventions not related to primary care (n = 21; n* = 1)

#### Included

- Included in final evidence review (n = 36; n* = 4)

---

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APPENDIX B. CMS LUNG CANCER SCREENING REQUIREMENTS

Medicare beneficiaries considered high risk:

- Age 55 – 77 years old
- No current signs or symptoms of lung cancer
- At least a 30 pack-year history of tobacco smoking
- Current smoker or former smoker who quit within the past 15 years
- Written order for LDCT lung cancer screening

Documentation required as part of LDCT lung cancer screening order:

- Date of Birth
- Pack-year history of tobacco smoking
- Smoking status; if former smoker, the number of years since cessation
- Lack of signs and symptoms concerning for lung cancer
- The ordering provider’s National Provider Identifier (NPI)

Beneficiary receives written order for LDCT lung cancer screening during a lung cancer screening counseling and shared decision-making visit provided by a physician or qualified non-physician practitioner (physician assistant, nurse practitioner, clinical nurse specialist). The following elements must be met and documented as part of shared decision-making:

- Determination of beneficiary eligibility for screening (age, lack of signs or symptoms of lung cancer, pack-year history of tobacco smoking, and number of years since quitting, if a former smoker).
- Shared decision-making using one or more decision aids; must include benefits and harms of screening, follow-up diagnostic testing, over-diagnosis, false positive rate, and total radiation exposure.
- Counseling to include the importance of adhering to annual lung cancer screening with LDCT, impact of comorbidities, and ability/willingness to be diagnosed and treated.
- Counseling for former smokers regarding the importance of sustaining tobacco smoking abstinence; and for current smokers the importance of smoking cessation. If appropriate, information is provided about smoking cessation interventions.
- When appropriate the provision of a written order for lung cancer screening with LDCT.

(Centers for Medicare and Medicaid Services, 2015)
APPENDIX C. IOWA MODEL

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

1. Identify/Trigger Issues/Opportunities
   - Clinical or patient identified issue
   - Organization, state, or national initiative
   - Dated/new evidence
   - Accrediting agency requirements/regulations
   - Philosophy of care

2. State the Question or Purpose

3. Is this topic a priority?
   - Yes
   - Form a team
   - Is there sufficient evidence?
   - No
   - Conduct research
   - Yes
   - Reassemble

4. Appraise and Synthesize Body of Evidence
   - Conduct systematic search
   - Weigh quality, quantity, consistency, and risk

5. Analyze

6. Design and Plan for Practice Change
   - Engage patients and/or providers
   - Consider resources, constraints, and approval
   - Develop localized protocol
   - Create an evaluation plan
   - Collect baseline data
   - Develop an implementation plan
   - Prepare clinicians and materials
   - Promote adoption
   - Collect and report post implementation

7. Is change appropriate for adoption in practice?
   - Yes
   - Integrate and Sustain the Practice Change
     - Identify and engage key personnel
     - Integrate change into system
     - Monitor key indicators through quality improvement
     - Reinforce as needed
   - No
   - Consider alternatives

8. Disseminate Results

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APPENDIX D. PERMISSION TO USE THE IOWA MODEL

Permission to Use the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

Kimberly Jordan - University of Iowa Hospitals and Clinics <noreply@qualtrics-survey.com>
Tue 3/12/2019 9:12 AM
To: Formo, Teresa <teresa.trapp@ndsu.edu>

You have permission, as requested today, to review and/or reproduce The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. Click the link below to open.

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Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.
Lung Cancer Screening: Identification of High-Risk Patients and Shared Decision-Making

Lung cancer is often diagnosed at a late stage, rendering it the most common cause of cancer related deaths in the United States. Screening with low-dose computed tomography decreases lung cancer mortality by 20%. Current guidelines support lung cancer screening (LCS), yet less than 5% of eligible patients are screened for lung cancer.

Lung cancer screening is a complex process that begins with the identification of eligible patients and the initiation of shared decision-making (SDM). Identification of patients eligible for LCS is a logical extension to the documentation of patient smoking status already collected in primary care.

Lung cancer screening, including the SDM discussion, is reimbursable by CMS and insurance companies.

RECOMMENDATIONS

For the organizations to continue improvement in the identification of patients eligible for LCS and SDM, the following recommendations are made:

- Reinforce education to providers and clinic staff regarding the need for consistent documentation to increase the number of patients with enough documentation to determine LCS eligibility.
- Add reminders to charts for patients that are eligible for screening, currently being screened, and those refusing screening, to improve screening process.
- Continue to evaluate the LCS process by periodic chart audits for documentation and referrals.
- Evaluate SDM discussions for documentation and charge capture.
- Provide education to patients to enhance SDM discussions.

<table>
<thead>
<tr>
<th>LCS Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>USPSTF</td>
</tr>
<tr>
<td>55 – 80 years</td>
</tr>
<tr>
<td>Current smoker</td>
</tr>
<tr>
<td>Former smoker quit &lt; 15 years</td>
</tr>
<tr>
<td>&gt; 30 years pack history</td>
</tr>
<tr>
<td>CMS</td>
</tr>
<tr>
<td>55 – 77 years</td>
</tr>
</tbody>
</table>

Lung Cancer Screening Executive Summary
PROJECT SUMMARY

The purpose of the project was to increase the knowledge of rural primary care providers at Redfield Clinic and Ashley Medical Center, regarding lung cancer screening guidelines and related CMS requirements and to increase their confidence in initiating shared decision-making discussions.

An educational intervention, consisting of a LCS education session and a LCS toolkit were developed for the project sites. The education sessions and toolkits were presented to Redfield Clinic on November 20, 2019 and Ashley Medical Center on November 27, 2019.

Impact of the project was assessed through (a) provider surveys collected pre-, immediate post-, and two-month post-education and (b) a chart audit collected pre- and two-month post education.

RESULTS

Provider Surveys (Pre-, Immediate Post-, and Two-Month Post-Education)

• Providers reported a benefit to the educational intervention.
• Providers exhibited an increase of knowledge in LCS guidelines and CMS requirements from pre- to two-month post-education with the greatest knowledge exhibited at immediate post-education and a high level of knowledge remaining at two months post-education.
• Providers reported a small increase in confidence in initiating SDM discussions.

Chart Audit (Pre-education to Post-education)

• Charts reviewed showed an increase in the percent of charts that had enough documentation to determine eligibility.
  o Redfield from 73% to 82%; a significant change
  o AMC from 62% to 69%
• Charts with enough documentation to determine patients at high risk for lung cancer demonstrated an increase in patients identified as eligible for LCS.
  o Redfield from 2% to 7%; a significant change
  o AMC from 5% to 9%
• Charts reviewed at Redfield demonstrated an increase in the number SDM discussions and referrals for LDCT. AMC did not have any documented SDM discussions or referrals for LDCT or specialist during the chart audit periods.
APPENDIX F. IRB APPROVAL

October 15, 2019

Dr. Kelly Buettner-Schmidt
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #PH20084, “Lung Cancer Screening: Identification of high-Risk Patients and Shared Decision-Making”

Co-investigator(s) and research team: Teresa Formo
Date of Exempt Determination: 10/15/2019 Expiration Date: 10/14/2022
Study site(s): Ashley Medical Center and Redfield Clinic
Sponsor: n/a

The above referenced human subjects research project has been determined exempt (category #1, 4(ii)) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, Protection of Human Subjects). This determination is based on the original protocol submission (received 10/11/2019).

Please also note the following:
• If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
• The study must be conducted as described in the approved protocol. Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
• Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
• Report any significant new findings that may affect the risks and benefits to the participants and the IRB.

Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

Sincerely,

Kristy Shirley, CIP, Research Compliance Administrator

For more information regarding IRB Office submissions and guidelines, please consult https://www.ndsu.edu/research/for_researchers/research_integrity_and_compliance/institutional_review_board_irb/. This Institution has an approved Federal Wide Assurance with the Department of Health and Human Services: FWA0002439.
October 11, 2019

NDSU Institutional Review Board
NDSU Department 4000
PO BOX 6050
Fargo, ND 58108-6050

To whom it may concern,

This letter is to indicate the intent of the Ashley Medical Center to collaborate in Teresa Formo’s practice improvement project, “Lung Cancer Screening: Identification of High-Risk Patients and Shared Decision-Making.” This project will start in October of 2019 and end in January of 2020. I am aware of Ms. Formo’s intent to provide education regarding lung cancer screening guidelines and CMS requirements for shared decision-making. I understand the knowledge gained by providers will allow for sustained adoption of lung cancer screening guidelines. Staff at Ashley Medical Center Clinic will be encouraged to participate, but participation is voluntary.

As part of this project, Ms. Formo will have permission to review the charts of patients ages 55-80 seen in the clinic during the months of June / July 2019 and for two months following the education (TBD). The charts will be reviewed for documentation of smoking status, quit date, pack year smoking history, shared-decision making discussions and referral for low dose CT or specialist for lung cancer screening. No patient identifiers be collected on the patients and review will take place at Ashley Medical Center.

As part of this project, Ms. Formo has the permission to identify Ashley Medical Center as one of the project settings. The approved NDSU IRB protocol will be followed when conducting the project.

Thank you,

[Signature]
Jennifer Kaseman, LPN
Office Manager
Ashley Medical Center
October 11, 2019

NDSU Institutional Review Board
NDSU Department 4900
PO BOX 6050
Fargo, ND 58108-6050

To whom it may concern,

This letter is to indicate the intent of the Redfield Clinic to collaborate in Teresa Formo’s practice improvement project, “Lung Cancer Screening: Identification of High-Risk Patients and Shared Decision-Making.” This project will start in October of 2019 and end in January of 2020. I am aware of Ms. Formo’s intent to provide education regarding lung cancer screening guidelines and CMS requirements for shared decision-making. I understand the knowledge gained by providers will allow for sustained adoption of lung cancer screening guidelines. Staff at Redfield Clinic will be encouraged to participate, but participation is voluntary.

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As part of this project, Ms. Formo has the permission to identify Redfield Clinic as one of the project settings. The approved NDSU IRB protocol will be followed when conducting the project.

Thank you,

Kristin Baloun, RN, BSN
Clinic Director
Redfield Clinic
Lung Cancer Screening
TERESA FORMO, MSN, RN, DNP-STUDENT
NORTH DAKOTA STATE UNIVERSITY
NOVEMBER 20 AND 27, 2019

The purpose of the project is to increase knowledge of providers regarding lung cancer screening (LCS) guidelines, the related CMS requirements and shared decision-making discussions.
At the conclusion of this activity participants will be able to:

- Summarize the USPSTF and CMS Lung Cancer Screening Guidelines
- Determine the eligibility of patients at high risk for lung cancer
- Initiate LCS shared decision-making discussions
- Identify required elements for documentation of LCS

**Estimated Cancer Deaths in the US in 2019**

<table>
<thead>
<tr>
<th>Cancer Site</th>
<th>Males 2019</th>
<th>Females 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung &amp; bronchus</td>
<td>321,670</td>
<td>285,210</td>
</tr>
<tr>
<td>Prostate</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Liver &amp; intrahepatic bile duct</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Leukemia</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Esophage</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Brain &amp; other nervous system</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>All other sites</td>
<td>25%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Incidence rates, 2011-2015
National Rate is 56.0

Average annual rate per 100,000, age adjusted to the 2000 US standard population.


Incidence rates, 2011-2015
National Rate is 56.0

Average annual rate per 100,000, age adjusted to the 2000 US standard population.


90
Stage at Diagnosis & 5-Year Survival Rate

- Non-small cell lung cancer (NSCLC) 84% of all lung cancer
- 5-year survival rate is dependent on subtype of lung cancer and stage of disease

In South Dakota, 23.2% of lung cancer is diagnosed at an early stage. 5-year survival rate not tracked in South Dakota.

(Information from the American Lung Association)

Stage at Diagnosis & 5-Year Survival Rate

- Non-small cell lung cancer (NSCLC) 84% of all lung cancer
- 5-year survival rate is dependent on subtype of lung cancer and stage of disease

In North Dakota, 22.2% of lung cancer is diagnosed at an early stage. The 5-year survival rate for North Dakota is 23.3%.

(Information from the American Lung Association)
**The Evidence**

**Dutch-Belgium NELSON trial**
- Published 2018
- Randomized 16000 participants
- LDCT or no screening
- Screens at baseline, 1, 3 and 5.5 years
- Results showed a 33 – 44% reduction in lung cancer mortality  
  (de Koning et al., 2018)

**National Lung Screening Trial (NLST)**
- Published 2011
- Randomized > 53,000 heavy smokers to
  - low dose computed tomography (LDCT) or chest x-ray (CXR)
  - 3 annual screens
  - Followed for 6.5 years
  - Results found a reduction in lung cancer deaths by 16 – 20%
  (Masoli et al., 2011)

**Multicentric Italian Lung Detection (MILD) trial**
- Published 2019
- Randomized 4,099 participants to
  - LDCT or no screening
  - Annual or biennial screens for 6 years
  - Results found a reduction in lung cancer deaths by 39% at 10 years
  (Vasile et al., 2018)

---

**Nancy**
Nancy

- 67 y/o female
- no medical history
- current smoker
- 42-year pack history
- denies alcohol/drug use
- no surgeries
- never married / no kids
- works in the local grocery store
- mother died of lung cancer
- negative exam

Is Nancy eligible for lung cancer screening?

What puts Nancy at risk?

- Cigarette smoking
  - 81% of lung cancer is caused by smoking
  - risk of lung cancer increases with quantity and duration of smoking
  - National smoking rate is 16.4%
- Other risk factors include exposure to:
  - radon gas
  - second hand smoke
  - asbestos
  - occupational exposures

What puts Nancy at risk?
- Cigarette smoking
  - 81% of lung cancer is caused by smoking
- Risk of lung cancer increases with quantity and duration of smoking
- National smoking rate is 16.4%
- Other risk factors include exposure to:
  - radon gas
  - secondhand smoke
  - radon
  - occupational exposures

---

**U.S. Preventive Services Task Force**

Release Date: December 2013

**Recommendation Summary**

**Summary of Recommendation and Evidence**

<table>
<thead>
<tr>
<th>Population</th>
<th>Recommendation</th>
<th>Grade (What's This?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults Aged 55-80, with a History of Smoking</td>
<td>The USPSTF recommends annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.</td>
<td>B</td>
</tr>
</tbody>
</table>
Medicare covers low-dose computed tomography (LDCT) for lung cancer screening.

Eligibility criteria:
- Age 55 – 77
- At least 30 pack yr. hx smoking
- Current smoker or quit within past 15 yrs
- Requires Shared Decision-Making visit
- Requires patient be offered Smoking Cessation services
- Requires written order for screening CT
- Patient and exam data must be entered into CMS approved LCS Registry

CMS (2011)

<table>
<thead>
<tr>
<th>Organization</th>
<th>U.S. Preventive Services Task Force (USPSTF)</th>
<th>Centers for Medicare &amp; Medicaid Services (CMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Group</td>
<td>• Individuals with private health insurance</td>
<td>• Medicare beneficiaries</td>
</tr>
<tr>
<td>Age</td>
<td>• 55-80 years</td>
<td>• 55-77 years</td>
</tr>
<tr>
<td>Smoking status</td>
<td>• Current smoker or former smoker who quit within the past 15 years</td>
<td></td>
</tr>
<tr>
<td>Pack history</td>
<td>• Greater than or equal to 30 years</td>
<td></td>
</tr>
<tr>
<td>Lung cancer signs/symptoms</td>
<td>• Asymptomatic</td>
<td></td>
</tr>
<tr>
<td>Shared decision-making visit</td>
<td>• Required</td>
<td></td>
</tr>
<tr>
<td>Previous lung CT</td>
<td>• None (diagnostic or screening) within the past year</td>
<td></td>
</tr>
<tr>
<td>Screening frequency</td>
<td>• Annually</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Based on findings</td>
<td></td>
</tr>
<tr>
<td>Discontinue screening</td>
<td>• Exceed age limit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Greater than 15 years since quit date</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Development of health problem that will substantially limit life expectancy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Patient ability or willingness to have curative lung surgery</td>
<td></td>
</tr>
</tbody>
</table>

Nancy meets eligibility for screening
- Annual LDCT screening for lung cancer reduces lung cancer mortality by up to 20%.
- National screening rate is 4.2% among high-risk population.
- Low screening rates related to lack of access or low awareness and knowledge.
- South Dakota, 1 of 31 states in which Medicaid fee for service covers lung cancer screening.

Shared Decision-Making

- Process to facilitate decisions based on clinical evidence and patient's values
- Lung cancer screening was first modality in which the CMS required documentation of SDM for reimbursement
  (Poll, Wolf, & Lagen, 2013).

---

CMS Lung Cancer Screening Requirements

- **Decision Aid**
  - Use 1 or more decision aids

- **Discuss**
  - Benefits & harms of screening
  - Follow-up diagnostic testing
  - Overdiagnosis
  - False positive rate
  - Total radiation exposure

- **Counsel on**
  - Importance of adherence to annual lung cancer LDCT screening
  - Impact of comorbidities
  - Ability or willingness to undergo diagnosis and treatment
  - Importance of maintaining cigarette smoking abstinence if former smoker
  - Importance of smoking cessation if current smoker
  - Furnishing of information about tobacco cessation interventions

(CMS 2011)
Nancy’s Shared-Decision Making

- Explore LCS process
  - use of decision aid
  - lung CT process
  - what happens if something is found
  - risks from a biopsy
  - possibility of needing frequent follow-up CTs if nodule found
  - smoking cessation
- Assess her values and preferences
  - she does not want frequent contact with health providers
  - doesn’t want to worry about cancer
  - her mother died from cancer – horrible
  - mother did not quit smoking and waited until she could barely breathe
  - she is not ready to quit smoking
- Reach a decision
  - Nancy decides to have screening
  - will think about quitting smoking
- Evaluate decision
  - agree benefits outweigh risks

LDCT Lung Cancer Screening Order

- Date of birth
- Number of pack-years smoked
- Current smoking status, or for former smokers, the number of years since quitting smoking
- Statement that the beneficiary is asymptomatic
- National Provider Identifier (NPI) of ordering provider

CMS (2011)
CT Chest Screen

1. Determine eligibility
   - age
   - absence of symptoms
   - pack-year calculation
   - number of years since quit
2. Use 1 or more decision aids
   - include benefits, harms, follow-up diagnostic testing, over-diagnosis, false positive rate, total radiation exposure
3. Importance of adherence to annual LDCT, impact of comorbidities and ability or willingness to undergo diagnosis and treatment
4. Counseling on importance of maintaining cigarette abstinence, or furnishing information about tobacco cessation services
5. Written order
   - DOB
   - pack year history (number)
   - smoking status — years since quit
   - statement beneficiary asymptomatic
   - NPI
6. G0269 — counseling visit to discuss need for lung cancer screening LDCT (service is for eligibility determination and shared decision-making)
7. 287.891 - personal history of tobacco use/personal history of nicotine dependence OR F17.2XX — Nicotine dependence, cigarettes
   
   CMS (2011)
Nancy’s Results

**Impression:**
1. Lung Cancer Screening: LungRADS Category 2. Benign appearing (non-actionable) nodule(s).
   These types of nodules are commonly observed and require no immediate action. Current recommendations for eligible high risk individuals (criteria below) are routine annual screening with low dose CT.
2. Post inflammatory/infarct scarring in RML.

### What do the results mean?

<table>
<thead>
<tr>
<th>Category</th>
<th>Lung-RADS Score</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>1</td>
<td>Annual LDCT</td>
</tr>
<tr>
<td>Benign</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Probably Benign</td>
<td>3</td>
<td>6-month LDCT</td>
</tr>
<tr>
<td>Suspicious</td>
<td>4A</td>
<td>Referral to specialist, LDCT, PET/CT, tissue sampling based on nodule size</td>
</tr>
<tr>
<td>Very Suspicious</td>
<td>4B</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from the American College of Radiology, (2018). Lung-RADS® Version 2.5. [Link](https://www.acr.org/media/303/Files/LADSLungRADS SpecialtyConsumerCompanionV1.pdf)
Lung Cancer Screening Counseling & Shared Decision-Making Elements

1. Eligibility
   - Age
   - Asymptomatic
   - Pack-year history
   - Smoking status
   - Years since quit

2. Shared Decision-Making
   - Use of decision aids
   - Benefits & harms of screening
   - Follow-up diagnostic testing
   - Over-diagnosis
   - False positive rate
   - Total radiation exposure

3. Counseling
   - Adherence to annual lung cancer LDCT screening
   - Impact of comorbidities
   - Ability or willingness to undergo diagnosis & treatment

4. Counseling
   - Maintain smoking abstinence
   - Smoking cessation
   - Furnish tobacco cessation interventions

5. Order for lung cancer screening with LDCT

CMS (2011)

Toolkit
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APPENDIX I. LUNG CANCER SCREENING TOOLKIT

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Lung Cancer Screening Education Session

References:

Lung Cancer Screening Recommendations

<table>
<thead>
<tr>
<th>Organisation</th>
<th>U.S. Preventive Services Task Force (USPTF)</th>
<th>Centers for Medicare &amp; Medicaid Services (CMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Group</td>
<td>• Individuals with private health insurance • Medicaid beneficiaries</td>
<td>• Medicaid beneficiaries</td>
</tr>
<tr>
<td>Age</td>
<td>• 50-80 years • 50-71 years</td>
<td>• 50-71 years</td>
</tr>
<tr>
<td>Smoking Status</td>
<td>• Current or former smoker who quit within the past 15 years</td>
<td>• Former or current smoker</td>
</tr>
<tr>
<td>Pack History</td>
<td>• Former or current smoker</td>
<td></td>
</tr>
<tr>
<td>Lung Cancer History</td>
<td>• Asymptomatic</td>
<td>• Asymptomatic</td>
</tr>
<tr>
<td>Prior Decision-Making History</td>
<td>• Request</td>
<td>• Request</td>
</tr>
<tr>
<td>Previous Lung CT</td>
<td>• None (imaging or smoking within the past year)</td>
<td>• None</td>
</tr>
<tr>
<td>Screening Frequency</td>
<td>• Annually</td>
<td>• Annually</td>
</tr>
<tr>
<td>Discontinue Screening</td>
<td>• Excessive lung density anomalies • Current or former smoker &gt; age 80-100 years • Development of health problem that will substantially limit the expenency of screening • Falsely positive results in lung cancer screening</td>
<td></td>
</tr>
</tbody>
</table>

Lung Cancer Screening Recommendations Based on Findings:

<table>
<thead>
<tr>
<th>Category</th>
<th>Lung-RADS Score</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>1</td>
<td>Normal CT</td>
</tr>
<tr>
<td>Slight</td>
<td>2</td>
<td>Normal CT</td>
</tr>
<tr>
<td>Probable</td>
<td>3</td>
<td>6-months CT</td>
</tr>
<tr>
<td>Suspicious</td>
<td>4</td>
<td>Refer to specialist, LRT, PET/CT, bone scan based on nature of lesion</td>
</tr>
</tbody>
</table>

* Lung-RADS (lung imaging reporting and data system): Classification to aid with findings in LDCT screening exams for lung cancer for standardized follow-up and management.

References: MDSU (DNP Project), November 20, 2019.
Lung Cancer Screening Guidelines and Recommendations

<table>
<thead>
<tr>
<th>Organization</th>
<th>Eligibility Categories for Screening</th>
<th>Start Age</th>
<th>End Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Academy of Family Physicians</td>
<td>Evidence insufficient to recommend for a population screening.</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>American Association for Bronchoscopic Surgeons</td>
<td>Age 55 to 79 years with 30 pack-year smoking history.</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>American Cancer Society*</td>
<td>Age 55 to 79 years with a &gt;20 pack-year smoking history, who either currently smokes cigarettes or quit within the past 15 years.</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>American College of Chest Physicians</td>
<td>Age 55 to 79 years, symptomatic smokers and former smokers who have smoked at least 30 pack-years and are otherwise healthy.</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>American Lung Association*</td>
<td>Age 55 to 79 years with a &gt;20 pack-year smoking history and/or a history of lung cancer.</td>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>Center for Medicare &amp; Medicaid Services</td>
<td>Age 55 to 79 years with a &gt;20 pack-year smoking history and a history of lung cancer.</td>
<td>2013</td>
<td></td>
</tr>
</tbody>
</table>

*Updated recommendations include: lung cancer; history of lung cancer; history of lung cancer in a first-degree relative; history of smoking; history of chronic obstructive pulmonary disease; presence of a previous lung cancer. Consider a review of risk factors for developing new primary lung cancer in smokers or former smokers, including family history, smoking status, and exposure to environmental or occupational risks.

References


Long-Cancer Screening: A Summary Guide for Primary Care Clinicians

Lung Cancer Screening With Low-Dose Computed Tomography (LDCT)

**Background**

Primary care decisions often rely on a clinician's ability to assess the risks and benefits of lung cancer screening, and patients with a personal history of smoking or a family history of lung cancer might be at higher risk. The American College of Chest Physicians (ACCP) guidelines recommend LDCT for lung cancer screening in asymptomatic patients aged 55 to 80 years who have a smoking history of at least 20 pack-years. LDCT is a noninvasive, low-cost, and widely available imaging modality that can detect early lung cancer. The ACCP guidelines recommend LDCT because it is associated with a lower false-positive rate compared to other imaging modalities, such as magnetic resonance imaging (MRI) and positron emission tomography (PET). LDCT has been shown to detect early-stage lung cancer, which is more likely to be curable, compared to later-stage lung cancer.

**Overview of the Evidence**

In 2013, the American Society for Clinical Oncology (ASCO) recommended LDCT for lung cancer screening in asymptomatic patients aged 55 to 80 years with a smoking history of at least 20 pack-years. Since then, several studies have evaluated the effectiveness and safety of LDCT for lung cancer screening. These studies have shown that LDCT is effective in detecting early-stage lung cancer, but it also has a high false-positive rate, which may lead to additional imaging studies and biopsies.

**Rationale for Lung Cancer Screening**

LDCT has been shown to reduce lung cancer mortality by 20% to 25% in a population-based screening trial. However, the benefits of LDCT screening must be balanced against the potential harms, such as the induction of unnecessary biopsies and the psychological and financial burden of undergoing unnecessary tests.

**Summary of the Evidence**

LDCT is the most effective screening tool for lung cancer, and it is recommended for asymptomatic patients aged 55 to 80 years with a smoking history of at least 20 pack-years. LDCT is a noninvasive, low-cost, and widely available imaging modality that can detect early-stage lung cancer, which is more likely to be curable, compared to later-stage lung cancer. LDCT has been shown to reduce lung cancer mortality by 20% to 25% in a population-based screening trial. However, the benefits of LDCT screening must be balanced against the potential harms, such as the induction of unnecessary biopsies and the psychological and financial burden of undergoing unnecessary tests.

**Recommendations**

LDCT is the most effective screening tool for lung cancer in asymptomatic patients aged 55 to 80 years with a smoking history of at least 20 pack-years. However, the benefits of LDCT screening must be balanced against the potential harms, such as the induction of unnecessary biopsies and the psychological and financial burden of undergoing unnecessary tests. LDCT is a noninvasive, low-cost, and widely available imaging modality that can detect early-stage lung cancer, which is more likely to be curable, compared to later-stage lung cancer. LDCT has been shown to reduce lung cancer mortality by 20% to 25% in a population-based screening trial. However, the benefits of LDCT screening must be balanced against the potential harms, such as the induction of unnecessary biopsies and the psychological and financial burden of undergoing unnecessary tests.
Lung Cancer Screening: A Clinician’s Checklist

This checklist was developed to help clinicians meet the Centers for Medicare & Medicaid Services (CMS) criteria for lung cancer screening and shared decisionmaking visit. All of the criteria listed below must be met for the screening to be covered as a preventive service benefit under Medicare.

Before...
The Clinical Encounter

Determine patient’s eligibility.
- Is the patient 55 to 77 years old?
- Is the patient a current smoker or former smoker who has quit within the past 15 years?

During...
The Clinical Encounter

Complete all of the following activities:
- Document all elements in the patient’s electronic chart.
- Use a decision aid.
- Discuss potential benefits of lung cancer screening.
- Discuss potential harms of lung cancer screening, including:
  - False positive results
  - Following testing if an abnormality is found

After...
The Clinical Encounter

Establish the next steps:
- If the patient would like screening, provide a written order for the lung cancer screening visit with the following elements:
  - Patient’s date of birth
  - Actual pack-year smoking history
  - Current smoking status, if former smoker, the number of years since quitting
  - Statement that the patient is asymptomatic
  - Provider order identifier (NPI) of the ordering practitioner

- If the patient declines screening, document the discussion and the patient’s decision in the chart/medical record.
- If the patient is unsure about screening or needs more time, consider scheduling a follow-up visit to discuss the patient’s screening decision.

For all patients, reinforce the importance of smoking cessation and adherence.

Screening is not recommended:
- For the patient is current smoker, encourage smoking cessation and provide resources.
- If the patient is a former smoker, encourage continued adherence and provide additional support if needed.

Hypertension, postmenopausal women, and smokers, but not screening. Patients with a history of lung cancer need surveillance, but not screening.

Tips To Promote a Shared Decision

Be a five-step process for shared decision-making.
- Identify and explain the potential benefits and harms of each option.
- Ask the patient about their smoking history.
- Assess the patient’s level of understanding.
- Reduce the decisionist example by the time.

The importance of shared decisionmaking

Lung cancer screening with low-dose computed tomography (LDCT) reduces mortality from lung cancer. There are also potential harms associated with lung cancer screening, including a higher false positive rate and the associated need for diagnostic follow-up, known and unknown risks of additional testing associated with incidental findings, cumulative radiation exposure, and undiagnosed. Shared decisionmaking is a collaborative patient-centered process in which patients and clinicians make decisions together, outline the content of the best evidence and recommendations and based on the patient’s values and preferences.

Table of Points

- Follow specific points to address during the clinical encounter.
- Use a decision aid when discussing.
- Discuss potential benefits and harms of each option.
- Ask the patient about their smoking history.
- Assess the patient’s level of understanding.
- Reduce the decisionist example by the time.

Teach-Back Examples

- I know you have a lot of information. Tell me in your own words what you have learned.
- What are your thoughts about lung cancer screening?
- Let’s stop right there, for a moment. What questions or concerns do you have about the information I have given you?

Reframed Information

- Use a referral to another facility that meets the CMS eligibility criteria, please visit

www.cms.gov/medicare/
HowTo/GeneralInformation/
MedicareCoverage/CoverageLungCancerScreening.html

Agency for Healthcare Research and Quality
Attributes, Evaluating Evidence in Health Care, 2011

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LUNG CANCER SCREENING DOCUMENTATION SAMPLES

OPTION 1:
Nancy is 65 years old with a smoking history of 40 pack years. Nancy is current/former smoker, (clinical smoking status) and has a 20-year smoking history. She is at risk for lung cancer, a reasonable lifetime expectation, and is willing to consider lung cancer screening if recommended. Benefits and harms of lung cancer screening with LDCT scans were discussed. Benefits included early detection and treatment, which may improve survival. Harms included false positives and potential for unnecessary testing. The patient endorsed the importance of smoking cessation and maintaining smoking cessation. Nancy did not wish to proceed with lung cancer screening. She was informed that smoking cessation information is available. 
Nancy was counseled on the importance of smoking cessation and the role of lung cancer screening in the management of smoking-related conditions. The patient was counseled on the importance of maintaining smoking cessation in lung cancer prevention. After considering the risks and benefits of lung cancer screening for Nancy, she has decided to enroll. 

OPTION 2:
Nancy is a 65-year-old with a smoking history of 40 pack years. Nancy is current/former smoker. (clinical smoking status) and has a 20-year smoking history. She is at risk for lung cancer, a reasonable lifetime expectation, and is willing to consider lung cancer screening if recommended. Benefits and harms of lung cancer screening with LDCT scans were discussed. Benefits included early detection and treatment, which may improve survival. Harms included false positives and potential for unnecessary testing. The patient endorsed the importance of smoking cessation and maintaining smoking cessation. Nancy did not wish to proceed with lung cancer screening. She was informed that smoking cessation information is available. 
Nancy was counseled on the importance of smoking cessation and the role of lung cancer screening in the management of smoking-related conditions. The patient was counseled on the importance of maintaining smoking cessation in lung cancer prevention. After considering the risks and benefits of lung cancer screening for Nancy, she has decided to enroll. 

AMERICAN LUNG ASSOCIATION.

Should my patient be screened for lung cancer?

Screening is a tool used to detect lung cancer before any symptoms appear. Screening with low-dose CT (LDCT) scans can reduce deaths from lung cancer. Before low-dose CT screening, you should have a discussion with your patients about the risks and benefits of lung cancer screening. The patient must be at high risk for lung cancer. The patient must also be interested in lung cancer screening. The patient must also be willing to undergo lung cancer screening. The patient must also be able to undergo lung cancer screening. The patient must also be able to undergo lung cancer screening. 

American Lung Association.

Q: What should I discuss with my patient who may be a candidate for lung cancer screening?

A: You should discuss with your patient who may be a candidate for lung cancer screening.

- The risks and benefits of lung cancer screening.
- The results of previous tests and scans.
- The patient's medical history.
- The patient's family history.
- The patient's smoking history.
- The patient's personal history.
- The patient's preferences.
- The patient's willingness to undergo lung cancer screening.
- The patient's ability to pay for lung cancer screening.

American Lung Association.

Q: What should I discuss with my patient who may be a candidate for lung cancer screening?

A: You should discuss with your patient who may be a candidate for lung cancer screening.

- The risks and benefits of lung cancer screening.
- The results of previous tests and scans.
- The patient's medical history.
- The patient's family history.
- The patient's smoking history.
- The patient's personal history.
- The patient's preferences.
- The patient's willingness to undergo lung cancer screening.
- The patient's ability to pay for lung cancer screening.

American Lung Association.

Q: What should I discuss with my patient who may be a candidate for lung cancer screening?

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- The risks and benefits of lung cancer screening.
- The results of previous tests and scans.
- The patient's medical history.
- The patient's family history.
- The patient's smoking history.
- The patient's personal history.
- The patient's preferences.
- The patient's willingness to undergo lung cancer screening.
- The patient's ability to pay for lung cancer screening.

American Lung Association.
### Lung Cancer Screening: Coverage in Health Insurance Plans

The 2011 National Lung Screening Trial (NLST) found screening individuals at high risk for lung cancer could reduce mortality from the nation’s leading cancer killer by as much as 20 percent. Subsequently, the U.S. Preventive Services Task Force gave lung cancer screening a B recommendation, and Medicare also added coverage of screening for individuals at high risk. Below is an explanation of how screening is covered for various types of insurance.

<table>
<thead>
<tr>
<th>Plan/Type of Plan</th>
<th>Population Served by Plan</th>
<th>Requirement for Coverage of Lung Cancer Screening (Must meet ALL criteria)</th>
<th>Cost-Sharing Allowed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicare's National Coverage Determination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional Medicare</td>
<td>Ages 65+</td>
<td>Coverage implemented in Medicare Part B for ages 55-77. No signs or symptoms of lung cancer 30 pack-years smoking history Current smoker or quit smoking in the last 15 years</td>
<td>No, patients should not be charged a copay, coinsurance, or deductible for screening. However, patients must go to a Medicare-approved facility and provider to avoid extra costs.</td>
</tr>
<tr>
<td>Medicare Advantage (MA)</td>
<td>Ages 65+ who opt for Medicare Advantage plans</td>
<td>Coverage required for ages 55-77. MA plans may opt to cover screening for individuals 78 and older. No signs or symptoms of lung cancer 30 pack-years smoking history Current smoker or quit smoking in the last 15 years</td>
<td>No, patients should not be charged a copay, coinsurance, or deductible for screening. However, patients may need to go to an “in-network” facility and provider to avoid extra costs.</td>
</tr>
<tr>
<td>U.S. Preventive Services Task Force (USPSTF) Recommendation*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Expansion</td>
<td>Income up to 138% of the Federal Poverty Level (in states that have chosen to expand Medicaid), including childless adults</td>
<td>Age 55-80 30 pack-years smoking history Current smoker or quit smoking in the last 15 years</td>
<td>No, patients should not be charged a copay or other costs for screening. However, patients should check if there are certain facilities or providers they must use for the screening to avoid extra costs.</td>
</tr>
<tr>
<td>State Health Insurance Marketplace Plans</td>
<td>Mostly the unemployed, self-employed, part-time workers, and employees of small companies. Individuals and families who make up to 400% of the Federal Poverty Level are eligible for subsidies</td>
<td>Age 55-80 30 pack-years smoking history Current smoker or quit smoking in the last 15 years</td>
<td>No, patients should not be charged a copay, coinsurance, or deductible for screening. However, patients may need to go to an “in-network” facility and provider to avoid extra costs.</td>
</tr>
</tbody>
</table>
Large Group and Self-Insured Plans*  
Employees of large employers (over 50 employees), member of unions.  
Age 55-69  
10 pack-years smoking history  
Cessation of smoking or quit smoking in the last 15 years  
No, patients should not be charged a copay, coinsurance, or deductible for screening. However, patients may need to go to an ‘A network’ facility and provider to avoid extra costs.

Other

Traditional Medicare  
Low-income individuals, mostly elderly, pregnant women and disabled  
No automatic requirement. Coverage set by state policymakers.  
Yes

Small Group and Individual Plans (Outside Marketplaces)*  
Mostly the unemployed, self-employed, part-time workers, and employees of small companies.  
Many plans must comply with the USPSTF standard mentioned above. However, certain plans – like short-term limited-duration plans, association health plans and plans sold directly by for-profit businesses or health ministries – do not have to follow these standards and may not cover lung cancer screening.

Varies.

* Grandfathered plans are not required to cover preventive services without cost-sharing.

** The U.S. Preventive Services Task Force (USPSTF) issued a new B recommendation for lung cancer screenings on December 30, 2013 for those at high risk. Under the Affordable Care Act, most plans must cover preventive services given an ‘A’ or ‘B’ by the USPSTF.

Lung-RADS Version 1.1  
Assessment Categories Release date: 2010  

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Probability Range</th>
<th>Risk Assessment</th>
<th>Type of Imaging</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected</td>
<td>Lesions with malignant features consistent with lung cancer</td>
<td>&lt;=1%</td>
<td>C TTX, PET-CT</td>
<td>CT or PET-CT</td>
<td>Refer to the radiologist for further evaluation</td>
</tr>
<tr>
<td>Probable</td>
<td>Lesions with malignant features consistent with lung cancer</td>
<td>2% - 10%</td>
<td>C TTX, PET-CT</td>
<td>CT or PET-CT</td>
<td>Refer to the radiologist for further evaluation</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Lesions with malignant features consistent with lung cancer</td>
<td>10% - 20%</td>
<td>C TTX, PET-CT</td>
<td>CT or PET-CT</td>
<td>Refer to the radiologist for further evaluation</td>
</tr>
<tr>
<td>Benign</td>
<td>Lesions with malignant features consistent with lung cancer</td>
<td>&gt;20%</td>
<td>C TTX, PET-CT</td>
<td>CT or PET-CT</td>
<td>Refer to the radiologist for further evaluation</td>
</tr>
</tbody>
</table>

Updated: 10/21/2019.
<table>
<thead>
<tr>
<th>Decision Aid</th>
<th>Source</th>
<th>Media</th>
<th>Personal Risk Assessment</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHOULD I SCREEN</td>
<td>University of Michigan</td>
<td>Web – Interactive</td>
<td>Yes</td>
<td><a href="https://shouldiscreen.com/">https://shouldiscreen.com/</a></td>
</tr>
<tr>
<td>UNDERSTANDING LUNG CANCER SCREENING</td>
<td>G2 Foundation for Lung Cancer</td>
<td>Web – Interactive and Print</td>
<td>No</td>
<td><a href="https://g2foundation.org/for-professionals/">https://g2foundation.org/for-professionals/</a></td>
</tr>
<tr>
<td>LCS SAVES LIVES</td>
<td>American Lung Association</td>
<td>Web – Interactive and Print</td>
<td>No</td>
<td><a href="http://www.savedbythescan.org/">http://www.savedbythescan.org/</a></td>
</tr>
<tr>
<td>LCS BENEFITS, HARMs OF CHEST CT SCANS</td>
<td>Health Decision</td>
<td>Web – Interactive</td>
<td>Yes</td>
<td><a href="https://www.healthdecision.org/fpool.html#pool/lungca">https://www.healthdecision.org/fpool.html#pool/lungca</a></td>
</tr>
</tbody>
</table>
Lung Cancer Screening Decision Aid

Lung Cancer is:
- The leading cause of cancer death in the United States. Every year about 200,000 people die from lung cancer.
- The 27th most common cancer in the United States. Every year about 150,000 people are diagnosed with lung cancer.
- About 4% of all people with lung cancer are asymptomatic.
- About 1 out of every 10 people with lung cancer die because it is often diagnosed too late.
- Curable with surgery when found early.

Lung Cancer Screening
- Every 9th person in the United States is screened every year.
- If you are not willing to be screened every year you are eligible.
- You should be screened if you have a history of smoking or if you have experienced any of the symptoms of lung cancer.
- Harm of screening:
  - False positives are found in 30% of people during screening that are not cancers.
  - Additional risks or complications may be found.
  - Anxiety and stress waiting for results and additional testing.
  - Exposure to radiation. The LDCT scan uses 5% less radiation than a regular CT.
  - Overdiagnosis or treatment for a cancer that would not have caused any problems.

Understanding the Results:
- Positivity the scan shows something abnormal.
- You may need to have additional scans or other procedures for diagnosis.
- Negative: there were no abnormal findings on the scan.

Insurance Coverage
- Private insurance covers screening for men 55 through 80.
- Medicare covers screening for people ages 55 or 77.
- Additional costs for follow-up exams and treatments after the initial screen. Contact insurance companies to find if procedures are covered.

Reduce Lung Cancer Risk
- Stop smoking or never start smoking.
- Call 1-888-QUIT-4-WA (1-888-778-8483).
- Avoid exposure to secondhand smoke, radon, and hazardous materials in the workplace.

Resources
- American Cancer Society [link]
- American Lung Association [link]
- National Foundation for Lung Cancer [link]

Is Lung Cancer Screening Right for Me?

A decision aid for people considering lung cancer screening with low-dose computed tomography.

What are the facts about lung cancer?
- Lung cancer is the leading cause of cancer death in the United States. Every year about 150,000 people die from lung cancer.
- About 1 out of every 10 people with lung cancer are asymptomatic.
- About 4% of all people with lung cancer die because it is often diagnosed too late.
- Curable with surgery when found early.

Who should be screened for lung cancer?
- The American Cancer Society recommends that people who are at increased risk for lung cancer should be screened for lung cancer.
- People who are at increased risk for lung cancer should be screened annually.
- People who are at increased risk for lung cancer should be screened every 2 years.
- People who are at increased risk for lung cancer should be screened every 3 years.
- People who are at increased risk for lung cancer should be screened every 4 years.

Possible signs and symptoms of lung cancer
- Cough that does not go away.
- Coughing up blood.
- Chest pain.
- Hoarseness.
- Unexplained weight loss.
- Difficulty breathing.
- Shortness of breath.
- Nausea and vomiting.
- Dizziness.
- Fainting.
- Headaches.

If you have any signs or symptoms of lung cancer, be sure to tell your health care professional.

What are the possible benefits and harms of lung cancer screening with LDCT?
- Harms: false positives and unnecessary procedures.

Is lung cancer screening right for me?

A decision aid for people considering lung cancer screening with low-dose computed tomography.

What are the possible benefits and harms of lung cancer screening with LDCT?
- Harms: false positives and unnecessary procedures.

What are the possible benefits and harms of lung cancer screening with LDCT?
- Harms: false positives and unnecessary procedures.
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Questions to Ask Insurance Company about Costs

- Are all the costs of the screening completely covered or will I be charged any out of pocket expenses?
  - Will I need to pay a facility fee?
  - Are there other out of pocket costs I will need to pay?

Notes:

Questions to Ask about Activities after the Screening

- Why do follow-up visits after my screening?
- Is my follow-up doctor’s visit covered under my insurance?
- If not, what are the expected out of pocket expenses?
- What follow-up tests will I need if something is detected during screening and will my insurance cover these tests?
- If the doctor recommends screening every year, will it be covered by my insurance?
- Will my insurance cover counseling and medications that can help me quit smoking? What are my out of pocket expenses?

Notes:
What is Cancer Screening?
Cancer screening is a test to check for disease in someone who does not have any symptoms. Some examples of cancer screening include mammograms for breast cancer, pap smears for cervical cancer, and colonoscopies for colorectal cancer. The goal of screening is to find cancer early when it is more treatable and even curable.

For lung cancer, low dose CT (LDCT) scans are the only proven method. Chest x-rays are not recommended for screening. To learn more see the patient education video on the “about screening” page at our website at www.go2foundation.org.

Why Should I Consider Screening?
Studies have shown that screening those at high risk with LDCT scans before symptoms appear can find lung cancer early, which is easier to treat and more likely to be cured. Lung cancer screening might also show if you have other conditions or diseases that need to be treated.

Who Should Be Screened for Lung Cancer?
Annual screening is recommended for individuals whose age, smoking history place them at higher risk for lung cancer. This means they have at least a 30 pack year smoking history and currently smoke or quit within 15 years. Most commercial insurances cover individuals aged 55-80, while Medicare covers those aged 55-77.

There is some research to support screening people who may be younger or who have smoked less but who also have another factor that increases their risk of lung cancer, such as a diagnosis of COPD, a family history of lung cancer or job exposure to cancer-causing agents like radon and asbestos. Tell your doctor and find out if a low-dose CT scan is right for you.

Note that screening for other risk factors may have a co-pay and deductible applied.

*How to calculate your pack years: Average number of packs smoked per day x number of years as a smoker = your pack years. Example: 1 pack a day for 30 years = 30 pack years. Example: 2 packs a day for 15 years = 30 pack years*

What Happens During a Low Dose CT Screening Test?
A machine called a CT scanner takes 3D x-ray pictures of your lungs using a small amount of radiation (also called a low-dose CT). This level of radiation is much lower than other types of CT scans.

This screening test for lung cancer takes about 20 minutes, and the actual scan only takes a few seconds.

Currently, this screening test is the only one that can find lung cancer early, which allows more treatment options to save lives.

Are There Risks Involved With Screening?
As with all cancer screening tests, this test is not perfect. Some cancers may still be missed. Some scans may show spots in the lung that look suspicious but may not be cancerous. These are called false positives. Similar to moles on the skin, your lungs may have nodules or spots that are watched but are normal or non-cancerous.

When needed, your doctor may recommend additional testing to diagnose or rule out lung cancer. Usually this is another low-dose CT in a few months to see if the spots found during your screening have changed. Every low-dose CT scan—whether your screening test or a follow-up scan—includes a small amount of radiation. In some instances, your doctor may refer you for minimally invasive tissue sampling (biopsy), or possible surgery or other treatments.

How Often Should I Be Screened?
Lung cancer can be aggressive and advance quickly between stages. This is why it is important to be tested every year until you are out of the recommended age range or for as long as your doctor recommends. Regular screenings will let your doctor see if spots in your lungs are stable or whether any changes over time may be more suspicious for cancer. Screening for lung cancer before symptoms appear is important. Without it, most people do not see signs of the disease until it has spread to other areas of the body, making it harder to treat. Talk to your doctor about the results of your screening to determine what you need to do next.

Is Screening Covered by Insurance?
For individuals who meet the high-risk criteria, low-dose CT screening for lung cancer is covered every year by Medicare and most private insurance plans at 100% with no out-of-pocket cost—just like mammograms and other screening tests. However, additional testing and follow-up scans between screenings may have a cost, such as a co-pay or deductible. Ask your doctor if your insurance covers the test.

Where Should I Be Screened?
You should be screened for lung cancer in an experienced center that follows approved guidelines for lung cancer screening. For example, there is CO Foundation-designated Screening Centers of Excellence nationwide. To find a center near you, call our Helpline at 1-800-298-2406 or visit our website at www.go2foundation.org.

Lung cancer screening with a low dose CT scan is recommended by leading advocacy, government, and medical groups, including the CO Foundation for Lung Cancer, Federal Government Agencies (Centers for Medicare & Medicaid Services), the United States Preventive Services Task Force (USPSTF), the National Comprehensive Cancer Network (NCCN), American College of Radiology, and the American Cancer Society.

Choosing a Screening Program
If you do not live near a CO Foundation-designated Screening Center of Excellence, here are some questions to ask your local screening center to determine if they are screening responsibly.

1. What test do you use to screen for lung cancer?
   The test should be a LDCT scan which means that the radiation amount is much lower than in a regular CT scan.

2. Who will interpret the scan?
   LDCT scans can be reviewed by every provider in the hospital. It is best for a radiologist with experience reading and reporting LDCT scans of the chest to be the one to interpret your scan.

3. What guidelines will be used if something is found?
   Several professional organizations have developed clinical guidelines specifically for lung cancer screening and your center should consistently follow one of them.

4. What will happen if something is found?
   Your program should work with your primary care provider to arrange any follow up tests or care that you need, preferably from a team of doctors who will work together to evaluate and treat you.

Contact us if you have questions
1-800-298-2406 | info@go2foundation.org | go2foundation.org

GO2 Foundation for Lung Cancer

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WHERE CAN I GO FOR MORE INFORMATION?

For more information about lung cancer, treatments and clinical trials, to discuss support options or for referral to other resources, please contact us.

HELPLINE | 1-800-298-3436 or support@go2foundation.org
SCREENING CENTERS OF EXCELLENCE
under Risk & Early Detection at go2foundation.org
WEBSITE | go2foundation.org

1700 K Street, NW, Suite 660, Washington, DC 20006
1100 Industrial Road, #1, San Carlos, CA 94070

Founded by patients and survivors, GO2 Foundation for Lung Cancer transforms survivorship as the world’s leading organization dedicated to saving, extending, and improving the lives of those vulnerable, at risk, and diagnosed with lung cancer. GO2 Foundation works to change the reality of living with lung cancer by ending stigma, increasing public and private research funding, and ensuring access to care.

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1-800-298-3436 | go2foundation.org
Hi Teresa,

Thanks for your email. You have our permission to use any questionnaire items in our survey. The questionnaire was adapted from the NCI questionnaires as cited in our papers.

The specific items related to guideline eligibility, however, are original since these guidelines did not previously exist. We created them originally at Wake Forest in 2012-2013 based on all of the guidelines available at the time with a group of cancer screening and health services researchers (see paper: DOI 10.1158/1055-9965.EPI-14-1241). These items were pilot tested with cognitive interviews prior to use.

We re-used these items but adapted for the USPSTF recommendations and CMS coverage criteria for the 2017 survey published in JNCCN. We also pilot tested these items again with physicians at both Vanderbilt and the VA prior to use and performed cognitive interviews. There has not been any formal psychometric testing on these items.

Let us know if you have any other questions.

Thanks,

Jennifer

Jennifer Lewis, MD, MS, MPH
VA Quality Scholars Fellow, VA TVHS
Co-Director, VA TVHS Lung Cancer Screening Program
Instructor, Division of Hematology/Oncology
Vanderbilt University Medical Center
APPENDIX K. SURVEY QUESTIONS

This survey includes items related to share decision-making, lung cancer screening, and demographic questions.

The below items 1 – 3 relate to shared decision-making.

1. How confident are you in initiating a shared decision-making discussion with a patient considering lung cancer screening?
   a. Not confident at all
   b. Somewhat confident
   c. Very confident

2. Which of the following elements are required for CMS reimbursement for shared decision-making in lung cancer screening (Select all that apply)?
   a. Benefits of screening
   b. Harms of screening
   c. False positives
   d. Follow-up testing
   e. Overdiagnosis
   f. Total radiation exposure
   g. Importance of adherence to annual screening
   h. Impact of comorbidities
   i. Ability or willingness to undergo diagnosis and treatment
   j. Importance of maintaining cigarette smoking abstinence if former smoker
   k. Importance of smoking cessation if current smoker Information about tobacco cessation interventions
   l. Other (please specify):
   m. Don’t know

3. Which of the following statements need to be included in the shared decision-making documentation for CMS reimbursement for patients considering lung cancer screening (Select all the apply)?
   a. Patient date of birth or age
   b. Specific pack-years smoking history
   c. Current smoking status
   d. Number of years since quitting smoking for former smokers
   e. Statement that the patient does not have any signs or symptoms of lung cancer
   f. Statement that the patient does not have a family history of lung cancer
   g. Other (please specify)
   h. Don’t know
The below items 4 – 9 relate to lung cancer screening guidelines:

4. At what age are patients eligible to begin lung cancer screening with low dose CT?
   a. 30
   b. 35
   c. 40
   d. 45
   e. 50
   f. 55
   g. 60
   h. 65
   i. Other (please specify)
   j. Don’t know

5. At what age are patients no longer eligible for lung cancer screening with low dose CT?
   a. 65
   b. 70
   c. 75
   d. 76
   e. 77
   f. 78
   g. 79
   h. 80
   i. 81
   j. 85
   k. Other (other please specify)
   l. No Upper age limits
   m. Don’t know

6. To qualify for lung cancer screening with LDCT, what is the minimum number of cigarette pack years (packs/day x years smoked) that a patient must have?
   a. 10 pack years
   b. 20 pack years
   c. 30 pack years
   d. 40 pack years
   e. 50 pack years
   f. Other (please specify):
   g. Don’t know

7. If a patient meets the minimum cigarette pack year requirement for LDCT screening, is it recommended for:
   a. Current smokers only
   b. Former smokers only
   c. Both current and former smokers
   d. Don’t know

8. Is LDCT recommended for patient with multiple, chronic comorbidities who are unable to undergo surgery?
   a. Yes
   b. No
   c. Don’t know

9. What is the recommended frequency for LDCT screening? Is it every:
   a. 1 year
   b. 2 years
   c. 4 years
   d. 5 years
   e. 10 years
   f. Other (please specify)
   g. Don’t know
The below items 10 – 11 are demographic questions about your practice:

10. What is your profession?
   a. Physician
   b. Physician Assistant
   c. Nurse Practitioner
   d. Clinic Support staff (Nurse, MA, Other Clinic Staff)

11. How many years have you been in clinical practice?
   a. 0-3 years
   b. 4-6 years
   c. 7-9 years
   d. 10-12 years
   e. Greater than 12 years
APPENDIX L. EDUCATION SESSION EVALUATION

Please complete the following education session evaluation questions.

1. The objectives in the lung cancer educational presentation were met
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

2. The content in the lung cancer educational presentation met my educational needs.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

3. The content in the lung cancer educational presentation will be beneficial to my practice.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

4. The content was easy to understand and free of bias.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

5. Any other comments:

6. Is there anything else related to lung cancer screening and shared decision-making you would have wanted to be included in the education in-service?

   Comments:
APPENDIX M. TOOLKIT EVALUATION

Please complete the following lung cancer screening toolkit evaluation questions.

1. The content in the lung cancer screening toolkit met my educational needs.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

2. The content in the lung cancer screening toolkit will be beneficial to my practice.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

3. The content in the lung cancer screening toolkit was easy to understand and free of bias.
   a. Strongly agree
   b. Somewhat agree
   c. Neutral
   d. Somewhat disagree
   e. Strongly disagree

4. Any other comments:

5. Is there anything else related to lung cancer screening and shared decision-making you would have wanted to be included in the lung cancer screening toolkit?

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