Increasing the Use of Preventative Lung Cancer Screening Services: A Quality Improvement Project

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Abstract

Lung cancer screening is a preventative measure that has proven to reduce cancer-related mortality. Although the benefits of lung cancer screening have been proven in select populations per the U.S. Preventative Services Task Force (USPSTF) guideline criteria, there is still a significant underuse of this preventative screening tool across the country. Lung cancer affects all populations but has been known to disproportionately affect the Native American community. This quality improvement project served to increase the identification of individuals at risk for lung cancer in a Native American, rural clinic. The electronic health record (EHR) was used to identify individuals eligible for lung cancer screening. The intervention included an EHR lung cancer screening flag in an individual's chart who had a history of smoking and were within the ages of 50 and 80 per the USPSTF lung cancer screening guidelines. This prompted the provider to consider smoking history and potential need for lung cancer screening. The number of lung cancer screening referrals were used as a measure of change before and after implementing the lung cancer screening flag. Altogether the study findings indicated success in the improvement of identification of those at risk for cancer and eligible for lung cancer screening. In the span of three months with the EHR intervention, 22 individuals were identified and referred for lung cancer screening compared to one individual in the three months prior to intervention, showing the pivotal role health informatics has in healthcare delivery.

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Problem Description

In the United States (U.S.), lung cancer is the leading cause of cancer death (Centers for Disease Control and Prevention [CDC], 2022). Statistics show more than 80% of individuals diagnosed with lung cancer in the U.S. are diagnosed at a late stage, causing these individuals to have poorer health outcomes than if diagnosed at an earlier stage (Okereke et al., 2019). Furthermore, the screening rate for individuals at high risk of developing lung cancer in the US ranges drastically by state from 1% to 17%; in the state of Oregon, only 7.8% of individuals who are identified as being at risk for lung cancer receive appropriate screening (American Lung Association, 2021). Klamath County, Oregon, has high death rates from lung cancer at 37.9 deaths between 2016 and 2020 (per 100,000 population), exceeding the state and national averages (33.9 and 35.0) (Healthy Klamath, 2023).

Native Americans in the U.S. have a high risk of lung cancer. Evidence shows that Native Americans have the highest smoking rate in the country, with a smoking prevalence of more than 1 in 5 individuals (Melkonian et al., 2020; Roubidoux et al., 2022; Centers for Disease Control and Prevention [CDC], 2020; Truth Initiative, 2020). This is significant because it is known that smoking is the greatest preventable, lifestyle risk factor for developing lung cancer (CDC, 2020). A rural health clinic (RHC) in Klamath County identified a significant underuse of lung cancer screenings. This RHC solely serves Native Americans by delivering primary care, making it an ideal place for preventative screenings. A barrier which prevented this clinic from implementing lung cancer screenings was difficulty identifying individuals at risk for lung cancer. This RHC benefited from using an intervention to bridge the gap between the most recent evidence-based

practice of preventative lung cancer screenings and the appropriate use of them in the rural, primary care setting.

Available Knowledge

Data show that early preventative screenings in the outpatient setting are known to decrease the overall cost of care, decrease patient hospitalizations, and improve the overall quality of care (Fowler et al., 2020). Lung cancer screenings alone reduce cancer-related mortality by 20% (Okereke et al., 2019). Furthermore, Roubidoux et al. (2022) states that low-dose computed tomography scan (LDCT) significantly reduces cancer-related mortality for American Indians and Alaskan Natives with significant smoking history of 20 pack years or more. In 2021, the U.S. Preventative Services Task Force (USPSTF) updated the lung cancer screening guidelines to include a broader range of individuals at risk for developing lung cancer (Krist et al., 2021). The USPSTF now recommends an annual LDCT for adults aged 50 to 80 who have a 20-pack-year smoking history and presently smoke or have undergone cessation within the last 15 years (Krist et al., 2021).

Recent evidence has identified interventions to increase the identification of those eligible for LDCT lung screenings. Kinsinger et al. (2017) identified the electronic health record (EHR) as useful in identifying individuals at risk for lung cancer. In their study, the EHR used patient age and smoking history as identification factors to flag patient charts. A clinical nurse would then assess the patient chart to determine if the patient met the specific USPSTF criteria for lung cancer screening. This study was conducted through eight primary care, academic medical centers where they successfully identified 4,246 individuals at risk for lung cancer per USPSTF guidelines and 57.7% of those individuals agreed to undergo a LDCT scan (Kinsinger et al., 2017). Marcus et al. (2015) study also supports the Kinsinger findings, where

identification of patients at high risk for lung cancer is considered the first step in improving health outcomes through early detection. A limitation of the Kinsinger at al. (2017) study is that the flagging of patient charts was done through patient's clinical records rather than during an actual visit; this contributed to inaccurate smoking histories and years since quitting.

Brenner et al. (2018) published a quality improvement (QI) study aimed at increasing lung cancer screening rates through the identification of those at risk. In addition to highlighting the importance of clinical reminders in the EHR, Brenner et al. also identified the critical importance of having a comprehensive protocol for medical teams in the clinic documenting patient smoking history in the EHR. They specifically identified a patient's lifetime cumulative smoking history in pack-years (the average cigarette packs smoked per day multiplied by years smoked) as well as years since quitting as the most critical patient history regarding lung cancer risk. Using the EHR, Brenner at al. also used visit-based reminders through the EHR to flag patients on the provider's charts to prompt physicians to consider whether a patient should be offered a LDCT scan; this visit-based reminder was also triggered by age and smoking history. The results showed that the clinic increased their use of LDCT lung cancer screenings by 76% for those eligible over the span of eight months. Brenner et al.'s study was a one-year study conducted at a large academic primary care setting serving over 13,000 adults with the clinic having an overall high experience with QI projects. Strengths of this study include the detail of interventions and the large clinical setting in which this project took place; there were 22 medical doctor attendings, 78 residents, 12 full-time physicians, 12 advanced practice providers, and 13 licensed practical nurses. Limitations to this study include the reproducibility; this clinic has an extensive history of QI efforts and projects and may not be as easily reproduced in settings that do not have an established "culture of change." Unlike Kinsinger et al.'s (2017) study, Brenner et

al.'s (2018) study implemented clinical reminders for providers during their patient's visit which allowed an opportunity for capturing accurate patient smoking history during the visit.

Another QI project using the EHR to identify individuals at risk for lung cancer noted an increase of early lung cancer detection by 24% (Russell & McNeill, 2022). This QI project revised the smoking history intake for patients, identified a way to flag at-risk individuals, and increased the number of referrals for lung cancer screening between the span of four years. Russel and McNeill (2022) used the USPSTF guidelines to lead their revision of their smoking history intake format and criteria for flagging individuals eligible for lung cancer screening. In revising their smoking history intake form, they found they were able to decrease the number of questions asked to get the most relevant information. As a result, they were able to consistently collect and share smoking history data for the purposes of assessing eligibility for lung cancer screening. Limitations of this study included no specific detail as to the size of the clinic and QI team, not including the specific questions used to assess smoking history, or specifically how it was inputted into the EHR.

In summary, research reveals that lung cancer is typically identified at late stages and that chest LDCT screenings can identify cancer early and decrease patient mortality rates by 20% (Okereke et al., 2019). Because the RHC identified serves Native American patients, this primary care clinic was a prime location for improving screening rates among underserved, underrepresented racial/ethnic groups. The USPSTF criteria for lung cancer screening has been used to set the parameters for identifying those at risk of having lung cancer. Many organizations and researchers have identified successful ways of identifying individuals at risk for lung cancer with the most effective interventions including the use of the EHR and standardizing the way the

smoking history is collected and documented. Yet, none of the research articles reviewed targeted Native American or other ethnic/racial minority patients in their projects.

Rationale

The Model for Improvement framework was utilized to implement the intervention to increase the identification of those eligible for lung cancer screenings in the RHC (Institute for Healthcare Improvement [IHI], 2021). This framework guides the implementation of interventions through an identified plan-do-study-act, or PDSA, cycle. By adhering to this framework, the QI team was able to state a goal, plan, enact the plan and then assess for any necessary changes. A critical part of the Model for Improvement included identifying a specific and measurable goal. This goal was defined and measured before implementing any interventions to thoroughly assess improvement or change.

A cause-and-effect diagram (see Figure 1) was created to address the barriers that affected the rates of lung cancer screenings within the identified RHC. This barrier assessment revealed that the RHC has many different resources and areas for improvement such as using the electronic health record to its full potential and identifying multiple individuals who could significantly impact the way the interventions are implemented (i.e., providers, medical assistants, nurses, health informatics staff).

Specific Aims

In August 2022, the RHC began to improve the identification of Native American individual adults aged 50 to 80 who have a 20-pack-year smoking history and presently smoke, or have undergone cessation within the last 15 years, and who were eligible for lung cancer screenings and increased referrals for LDCT.

Context

Located in Southern Oregon, the RHC identified is in rural Klamath County. The RHC serves the local tribes and is made up of three nurse practitioners, two medical doctors, seven medical assistants, four registered nurses, and 12 supporting staff. As of June 2022, the clinic had about 8,500 registered, Native American patients and out of those there were 3,500 active patients. Active patients were defined as patients who were seen at least once in the clinic within the last three years (2019-2022). The clinic serves individuals from Southern Oregon with some individuals traveling as far as 100 miles for care. Individuals receiving care at the RHC get their care covered through the tribal organization and being uninsured is not a barrier to healthcare.

Recent personnel changes within the RHC led to high workload on the staff, which made it difficult to standardize a way of identifying individuals at risk for lung cancer. At the RHC there was not a dedicated QI project team; however, there were two doctor of nursing practice (DNP) nurse practitioner (NP) faculty from the Oregon Health and Science University, an NP-DNP from the RHC, and a DNP student who were the QI team for the initiation of interventions at the RHC to increase the use of LDCT lung cancer screenings.

Interventions

Because the RHC has identified its EHR's ability to flag certain patient demographic and social factors, such as age and smoking history, it was utilized to identify individuals eligible for lung cancer screenings. The intervention included using the USPSTF lung cancer screening guidelines for criteria to set up an automated care guideline system to remind providers to assess patients as potential candidates for lung cancer screening. Assessment included patient age, average amount of packs smoked a day, the number of years smoked, and if applicable, cessation date.

The intervention was implemented using the EHR. The USPSTF guidelines were entered into the system to flag any patient between the ages of 50 and 80 with a smoking history. The EHR showed a lung cancer screening care guideline in patient charts as providers opened them for pre-visit planning which also served as a reminder for providers to update patient smoking information into the record as needed. The QI project intervention and the USPSTF care guidelines were presented to the clinic staff during an annual EHR presentation before the beginning of the intervention in August of 2022.

Measures

Measuring the number of lung cancer screening referrals made by the RHC provided a way to measure the impact of the intervention. A clinic patient chart review was conducted every month for three months after the implementation of the EHR flagging system to assess changes to the number of lung cancer screening referrals. The data were deidentified solely to numerical values indicating the total number of LDCT lung cancer screening referrals placed for each month for three months. The data were organized into a data table to compare month-to-month progress as an outcome measure.

Analysis

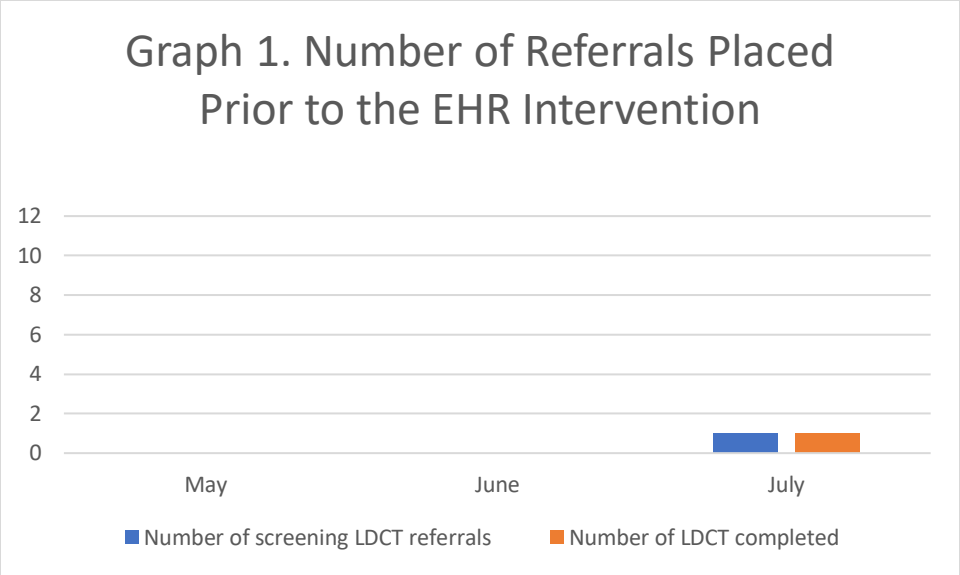
To conduct a thorough analysis, baseline data were gathered prior to the implementation of the intervention. This baseline data included reviewing clinic referrals and identifying the number of referrals for LDCT lung cancer screening placed in the span of three months, May to July 2022, prior to implementation of the intervention in August 2022. This baseline data provided a way to analyze the change in lung cancer screening rates after the intervention was implemented to assess the magnitude of change in referrals placed.

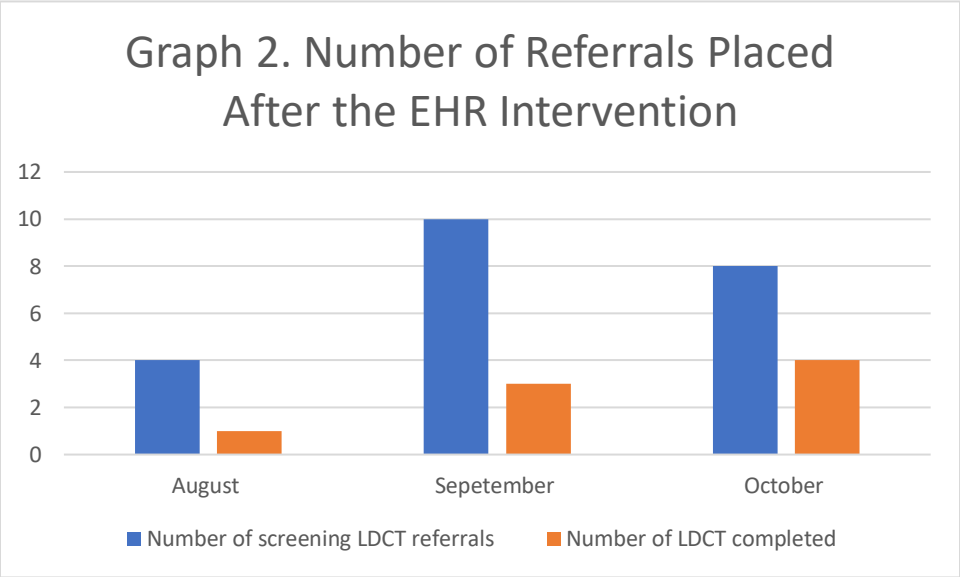
Ethical Considerations

An ethical consideration for this project was acknowledging the mistrust Native Americans may hold toward the medical system and the barrier it can be to their healthcare (Harding & Bott, 2019; Zestcott et al., 2020). Additionally, it is important to address a medical bias often held by healthcare personnel in the U.S. that this community is identified as a noncooperative or noncompliant patient population (Zestcott et al., 2020). However, it is critical to note that Native American tribes are resilient for having endured decades of oppression, racism, and injustices that have affected their health. This quality improvement project aimed to uphold the health of the Native American tribes of our state located in Southern Oregon as well as honor their strength and resiliency.

Results

After the implementation of the EHR intervention on the first of August 2022, there was an overall increase of LDCT referrals placed. The overall number of patients referred for lung cancer screening was 22; eight of those 22 (36.4%) followed up with the referral and had the LDCT done. Graph 1 shows the number of referrals placed and completed in the span of three months prior to the EHR intervention, also referred to as the baseline data. Prior to the intervention, there was one patient identified to benefit from a LDCT between May to the end of July. Graph 2 shows the number of referrals placed and completed in the span of three months after the intervention. As noted earlier, there was a total of 22 patients identified, between August to the end of October, to be candidates for lung cancer screening per the USPSTF guidelines.





Discussion

In summary, the findings showed an increase of LDCT referrals for lung cancer screening indicating success in helping the RHC improve identification of individuals at risk. There was an overall increase of referrals placed for LDCT from one in the span of three months prior to the intervention, to 22 for three months after the intervention. However, it is important to note that approximately 65% of the individuals identified to benefit from LDCT screenings per USPSTF guidelines did not follow-up with the referral, and that requires further investigation.

In comparing the number of new lung cancer screening referrals with the population of the RHC, we have learned that about 2.51% (22/875) of the active patients between the ages of 50 and 80 were identified as at risk for lung cancer after the EHR intervention. This is much greater than the 0.11% (1/875) of patients who were identified as at risk for lung cancer prior to the EHR intervention but is still less than the 7.8% Oregon state average screening rate (American Lung Association, 2021).

Strengths of this project included a cohesive QI team that worked closely together to monitor LDCT referrals placed. Additionally, the RHC welcomed the QI project and were thoroughly engaged with the EHR intervention. Lastly, the annual EHR training for new as well as current employees at the RHC will continue to include the USPSTF guidelines as part of their yearly training, meaning that the QI project with have long-term effects on the clinic in helping promote ways to identify patients at risk for lung cancer.

Limitations from this study included the inability to thoroughly identify the exact number of patients at the RHC who were smoking tobacco or were at risk for lung cancer. There were inconsistencies with relevant smoking ICD-10 codes used with patients and discrepancies with gathering smoking history among medical assistants, nurses, and healthcare providers. For example, when asked “Do you smoke tobacco?” many patients would say no and then there would be no follow up questions. This missed patients with extensive smoking histories because in subsequent visits when asked “Have you ever smoked tobacco in your life?”, patients who had originally said no to “do you smoke tobacco?” would say yes, they had an extensive smoking history (more than 20 pack years) and quit less than 15 years ago making them eligible for lung cancer screening.

Conclusions

Overall, the usefulness of the work in implementing an EHR intervention to remind providers to consider LDCT referral for patients at risk for lung cancer was helpful in the identification process. The impact of this QI project is sustainable for the RHC clinic as they can review this care guideline and USPSTF LDCT recommendations at their annual EHR clinic training. Additionally, the efforts for identification of individuals at risk for lung cancer is relevant to every primary care clinic.

Implications of these study findings show that the delivery of healthcare is multifaceted and that there is a great usefulness for health technology in QI projects. A future step of this project includes standardizing the way smoking history is documented through patient history gathering and using consistent ICD-10 codes. Another future step includes assessing the barriers and factors affecting why many individuals did not follow-up with the LDCT referrals placed.

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Figure 1: Root Cause Analysis