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Lung Cancer Screening in People with HIV: A Mixed-Methods Study of Patient and Provider Perspectives

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Abstract

Introduction: People with HIV (PWH) are at higher risk of lung cancer; however, there is limited research on attitudes, barriers and facilitators to lung cancer screening (LCS) in PWH. The objective of this study was to understand perspectives on LCS among PWH and their providers.

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Methods: Surveys of PWH and HIV-care providers were complemented by qualitative focus groups and interviews designed to understand determinants of LCS in PWH. Participants were recruited through an academic HIV clinic in Seattle, WA. Qualitative guides were developed by integrating the Consolidated Framework for Implementation Research and the Tailored Implementation of Chronic Diseases checklist. Themes which emerged from thematic analyses of qualitative data were compared to surveys in joint-displays. All study components were conducted between 2021–2022.

Results: Sixty-four PWH completed surveys and 43 participated in focus groups. Eleven providers completed surveys and 10 were interviewed for the study. Themes from joint-displays demonstrate overall enthusiasm for LCS among PWH and their providers, particularly with a tailored and evidence-based approach. Facilitators in this population may include long-standing engagement with providers and health systems and an emphasis on survivorship through preventive healthcare interventions. PWH may also face barriers acknowledged by providers including a high level of medical comorbidities and competing issues such as substance abuse, mental health concerns and economic instability.

Conclusions: This study reveals PWH and their providers have overall enthusiasm towards screening. However, tailored interventions may be needed to overcome specific barriers, including complex decision making in the setting of medical comorbidity and patient competing issues.

Introduction

More than half of the 1.2 million people with HIV (PWH) in the United States are over the age of 50,¹ reflecting widespread use of antiretroviral therapy and a decline in new infections. This “graying” of the population has resulted in an increase in chronic diseases and comorbidities of aging in PWH.^{2–4} Lung cancer is now the leading cause of cancer death among PWH, who are at higher risk for lung cancer than the general population,^{5–7} reflecting both higher smoking prevalence,^{8–10} and an independent association with HIV.^{11,12} Numerous studies demonstrate that PWH experience delays in diagnosis and worse outcomes after diagnosis of lung cancer, adding to the imperative of prevention and early detection in this group.^{13–15}

Lung cancer screening (LCS) with annual low-dose chest CT can reduce lung cancer mortality by 20% in high-risk individuals.^{16,17} The United States Preventive Services Task Force (USPSTF) and Centers for Medicare and Medicaid Services (CMS) have recently extended eligibility to people who currently (or formerly within 15 years) smoke older than 50 with at least a 20 pack-year smoking history. A higher percentage of PWH meet these criteria.^{18,19} While few PWH were included in LCS clinical trials, modeling data suggests a similar benefit of LCS for PWH with well-controlled disease compared to the general population,²⁰ and large cohort studies demonstrate that even further extensions in eligibility criteria may be needed to address the lung cancer risk at younger ages seen in PWH.²¹

The only two contemporary studies of LCS in single-center clinical cohorts suggest uptake of LCS in PWH is low (between 2.7–14%);^{22,23} However, there have been no studies of attitudes, barriers, and facilitators of LCS in this high-risk population. The objectives of this

mixed-methods study were to explore perspectives of PWH and their providers to better understand the determinants of LCS to inform interventions to improve LCS in this group.

Methods

Study Population

This study used concurrent quantitative (surveys) and qualitative (interviews and focus groups) components to triangulate data on the determinants of LCS for PWH. All study components were completed between February 2021 and February 2022. Recruited PWH and providers either received or provided care at the Madison Clinic, an HIV primary care clinic within the Harborview Medical Center, a county safety-net hospital affiliated with the University of Washington (UW) in Seattle, Washington. Madison Clinic is the largest dedicated HIV clinic in the Pacific Northwest, seeing over 4000 patients annually. There are 48 providers who care for patients within the clinic.

Eligible patient participants were PWH who received care at Madison Clinic and qualified for LCS by USPSTF 2021 guidelines.¹⁸ Patients were recruited from a clinic-based research registry, through which brief demographic information and smoking status were provided. Patients who appeared eligible by age and smoking status were prioritized for contact, as were women and those who were Black, Indigenous or Persons of Color (BIPOC). 240 patients were contacted, 100 responded and completed a brief telephone survey to determine eligibility as per USPSTF 2021 guidelines, 75 of these were determined eligible and 64 ultimately agreed to participate in the research study and completed surveys. Of these participants, 43 also attended focus groups. Providers were recruited through an email to all clinicians at Madison Clinic. The goal enrollment was 10 providers; the first 11 who responded completed surveys, and 10 completed interviews.

Measures

Surveys of both PWH and providers were designed to be completed in 15 minutes and were completed electronically or verbally with the assistance of a research coordinator prior to qualitative discussions. Surveys of PWH included information on demographics, cancer screening history, comorbidity, healthcare utilization, health literacy^{24,25} and smoking history. They also included 9 questions using a Likert scale to understand knowledge, attitudes, and the impact of HIV on LCS. Provider surveys included information on demographics and practice and similarly included 13 questions using a Likert scale on knowledge, attitudes, and care practices around LCS in PWH. Given limitations on research specific to LCS in PWH, these questions were adapted from prior surveys in broader populations of patients and providers.^{26,27}

Both the focus groups and interviews were semi-structured. Six co-authors (MT, MCB, MS, JZB, PER, KC) were involved in the development of the guides, allowing input from experts in HIV care (JZB), implementation science (MCB), HIV-pulmonary research (KC) and LCS (MT). Two implementation frameworks helped to inform the content of our qualitative guides. First, the Tailored Implementation of Chronic Diseases (TICD) checklist, including specific subconstructs: the “Patient Factors” domain (patient needs, preferences,

beliefs and knowledge), the “Health Professional Factors” domain (knowledge and skills, and cognitions/attitudes) and the “Guideline Factors” domain (cultural appropriateness, accessibility, consistency and compatibility).²⁸ Second, the Consolidated Framework for Implementation Research (CFIR) was used,²⁹ ensuring prompts across the domains of the Inner Setting, Outer Setting, Intervention Characteristics, Characteristics of Individuals and Process.

A total of 8 focus groups were completed with between 2 and 8 patient participants each. Focus groups were led by two members of the study team (MCB and MS). Due to the ongoing Covid-19 pandemic, the majority were conducted over HIPAA-compliant Zoom, with one conducted in-person at Madison Clinic. Interviews with providers were all completed over Zoom by MCB and MS. Interviews and focus groups lasted between 60 and 90 minutes. Patient participants received \$40 for participation and providers received a \$10 gift card.

Statistical Analysis

All survey data is presented in summarized form, either as percentages or medians with interquartile ranges. Focus groups and interviews were recorded and transcribed with analysis performed using Atlas.Ti software (ATLAS.ti Scientific Software Development GmbH). Transcripts were coded using principles of thematic analysis and an entirely inductive coding process, with codes and subsequent themes not bound to single framework constructs.³⁰ Six authors were part of the coding team for the participant focus groups. The first focus group transcript was reviewed and discussed to develop initial codes, which were then adapted and revised in group coding of a second transcript. Once the codebook was finalized, the transcripts were each double-coded by 2 members of the research team (MS, MCB and/or PER) to ensure reliability with any discrepancies discussed in the larger group. Codes were then organized in a matrix display and reviewed to develop summary memos. Three members of the research team (MS, MCB, MT) used the same approach to analyze provider interviews. Focus groups and interviews continued until thematic saturation was reached. At the conclusion of data collection, team members reviewed the summary memos overlaid with survey results to develop summary themes that emerged from the data sources, which were organized into joint displays. All participants provided verbal informed consent and the study was approved by the Fred Hutchinson Cancer Center Institutional Review Board.

Results

Sixty-four patient participants completed surveys. Most were men (81%) with a median age of 59 years (Table 1). Forty-six percent of participants identified as a race or ethnicity other than non-Hispanic White. Forty-three percent of the participants currently smoked, and the median pack-year smoking history was 35. Twenty-eight percent of participants reported a previous LCS exam. The 43 participants who attended focus groups were similar to the larger cohort of survey respondents. Patient surveys revealed that while the majority (98%) either “somewhat” or “strongly” agreed they had heard of LCS, less than half (48%) agreed that their provider had recommended they get LCS (Appendix Table 1). Most (86%)

agreed their HIV put them at higher risk for lung cancer, and most (97%) wanted healthcare information designed for PWH.

Of the 11 providers, the majority (10) were women, faculty attending physicians (9), and spent most of their clinical time providing care to PWH (7) (Appendix Table 2). Provider surveys revealed that most providers felt that lung cancer (82%) and cigarette smoking (91%) are major problems for PWH, and most providers agreed that the research evidence for LCS in PWH was strong (82%) and that LCS has more benefits than harms (82%).

Six themes emerged that encompassed both patient and provider data (Table 2). Two linked themes that were among the most pervasive were that both PWH and their providers expressed a broad awareness that the risk of diseases of aging, such as lung cancer, were higher in PWH, and they expressed overall enthusiasm for screening interventions tailored to this patient population. As one patient said, “I’ve been through a lot since I’ve been diagnosed with HIV...I think it is just important for people in general to have...screenings regularly, for things that are important like lung cancer...Because we’re so susceptible.” As a provider commented, “In general, my patients are enthusiastic about health screenings, like 80 to 85 percent of them are like ‘I spend a lot of time taking care of my health, I want to be healthy, and I want to live a long life.’” Other themes that emerged from both sources of data included the awareness of the causes of high risk of lung cancer in PWH, limitations in LCS knowledge, and awareness of cost-related barriers to screening.

There was specific divergence between patients and providers in two areas. First, providers were more aware than patients that having HIV increased the risk for lung cancer independent of smoking. As one patient commented, “[It] seems that anybody that had a pack of cigarettes is going to be high risk.” Second, while most patients and providers reported a valuable long-term patient-provider relationship which supported preventive care, some patients reported more skepticism towards healthcare recommendations. This was rooted in two experiences unique to their lived experience as older adults with HIV: 1) many were diagnosed with HIV at the height of the HIV pandemic and were told by providers they would not live healthy lives, and yet had survived for 20 years or more, and 2) many had personal experience or witnessed adverse effects from HIV medications.

There were 3 patient-specific themes which emerged (Table 3), two of which centered on health behaviors. The first was focused on survivorship. While previous perceptions of poor survival after HIV diagnosis may have led to tobacco use and other risky behavior in certain PWH, patients emphasized that narratives framed around long-term health now play an important role in their medical decision-making. The second encompasses “teachable moments” related to smoking cessation. For those who had been successful in quitting smoking, tobacco cessation had sometimes occurred as the result of either a conversation with a provider or experiencing a significant health event that caused the person to confront their risk of ongoing tobacco use. The final theme that emerged from patients was the importance of scientific evidence and research, as patients were very attuned to the role of scientific discovery in their survival. When discussing preventive care recommendations, one participant commented, “I think that it should be tailored to what the research is showing that we’re most vulnerable for.”

There were 3 provider-specific themes which emerged (Table 4). First, most providers noted barriers to LCS and acknowledged they were not discussing LCS with all eligible patients despite noting the benefits. They largely ascribed this to barriers present for all preventive care in their patients, including addressing the patients' acute issues, multimorbidity, mental health issues and substance abuse. As one provider commented, "...for people with HIV... the list of preventive things is fairly long. And a lot of my patients who have risk factors for lung cancer also have a pretty long list." Many providers mentioned that they simply "do not discuss" screening with patients who have competing concerns. Providers also noted specific barriers to LCS such as the complexities of determining patient eligibility, the requirement to perform shared decision-making, and issues with insurance, scheduling, and following through with appointments. As one provider noted, "there's a big drop off [after] they leave the office...and the completion rate is just a lot lower than we would hope." While providers consistently noted the potential benefit of LCS, LCS tended to be lower in importance compared to primary prevention efforts in cardiovascular disease and smoking cessation.

Discussion

Aging PWH may have a substantial population-level benefit from LCS, as both eligibility and risk is enriched in this population given higher rates of tobacco use.^{8,10} However, PWH may also face unique barriers to LCS, reflecting social determinants of health and a higher burden of comorbidities associated with aging that may increase the complexity of screening decision making.^{31,32} This study, using a mixed-methods approach to understand attitudes, barriers and facilitators for LCS in PWH and their providers, is one of the first to explore perspectives on LCS in PWH. Overall themes illustrate a strong awareness of lung cancer risk among PWH and their providers and overall enthusiasm for tailored approaches to LCS among PWH, but also suggest that barriers across the patient-, provider- and system levels may limit screening uptake.

Several of the emergent themes reflected both unique barriers to LCS in PWH and common barriers seen in other screen-eligible populations. Our data suggests that while almost all patients had heard of LCS (based on survey results), many did not understand what LCS entailed or who was eligible, which may lead to lower LCS uptake given this lack of awareness. Limitations of knowledge and understanding of LCS may be a barrier to screening for both PWH and their providers, similar to that seen in other studies in LCS-eligible cohorts.^{33,34 27,35-37} Patient-level barriers may be more common in PWH, including a higher burden of comorbidity, social and financial strains, and mental health and substance abuse issues. More than half of our participants reported an annual household income of <\$30,000 and comorbidities other than HIV requiring >3 provider visits per year. However, patients did not directly voice concerns regarding social and medical complexity as barriers to screening. Patients were more attuned to financial barriers related to screening. In contrast, providers considered both social and medical complexity as key barriers which may lead to avoid engaging patients in shared decision making for LCS. Providers uniformly discussed barriers across levels including system- and provider-level barriers (time and complexity of incorporating LCS into clinical practice), noted in other studies,^{27,35,36,38} and the impact of patient-level barriers common in their clinical practices, such as substance

use, mental health issues and complex and active medical issues which serve as barriers to discussing LCS and other preventive care interventions.

More unique to PWH, medical skepticism may be a barrier to LCS engagement among patients, given personal experiences with prior HIV prognoses and adverse effects of treatments. Triangulating our findings suggests that provider recommendations and their perceptions of barriers to LCS may have the most substantial impact on uptake. Both patient and provider perceptions around the construct of “patient needs and resources” have been noted barriers to LCS in other populations.³⁹ Less than half of the eligible patients reported receiving a provider recommendation to undergo screening, and almost all stated they would follow provider recommendations regarding LCS.

Despite these barriers, our results suggest there may be several unique facilitators to LCS in PWH. For PWH on therapy, there may be more consistent engagement with a provider, and these relationships can support preventive care. A consistent and usual source of health care has been associated with increased LCS shared decision making among LCS-eligible patients,⁴⁰ and PWH and providers in our study largely report trusting long-term relationships. Due to long-term management of HIV, where treatment has adapted to new evidence and a community and clinic emphasis on engaging in research, PWH may be more facile and experienced in understanding evidence-based approaches to prevention. The patients’ own relationship to long-term HIV survival also appears to impact screening attitudes. Many patients discussed long-term survivorship in the face of an HIV diagnosis informing their current health behaviors—and this may manifest as enthusiasm for preventative interventions.

In building interventions to improve the LCS process in PWH, it will be particularly salient to address barriers that lead providers to limit discussing LCS with eligible patients. Centralized LCS management, which supports LCS ordering and monitoring through a central clinic, has been shown to increase adherence to routine screening and potentially address health disparities.^{41,42} While this could alleviate the time and resource burden on providers, centralizing the process may also remove decision-making from longstanding patient-provider relationships and reduce the potential to tailor care to PWH. Tailored tools embedded in the EHR may be particularly beneficial to address both provider/system- and patient-level barriers, facilitating a more streamlined, efficient and personalized shared decision-making process for the provider and the patient. These tools could also include patient-endorsed facilitators such as emphasizing survivorship and an evidence-based approach informed by research specific to PWH. Finally, patient navigation may help overcome some specific barriers for patients, such as access, follow-up, cost and insurance concerns, and reassure providers that social and medical complexities can be addressed along the LCS care continuum.^{43,44}

Limitations

This study has several strengths including the use of multiple data sources to triangulate data to develop robust and consistent themes. The qualitative methods were also robust with a large and diverse qualitative team and each transcript, at minimum, being double-

coded. The enrolled patient participants also represent a heterogenous cohort of PWH including representation from women, BIPOC individuals and those who currently use tobacco. Limitations include representation from a single HIV program nested within a large academic medical center, which may limit generalizability to other settings of HIV care. While the cohort was diverse, PWH who are the most marginalized, including those with low access to care, low health literacy, competing health and social priorities were almost certainly under-represented in the study. Given limitations in prior data, validated survey instruments to assess knowledge and perceptions regarding LCS in PWH were also unavailable.

Conclusions

In conclusion, this study is among the first to examine attitudes, barriers and facilitators of LCS in PWH and their providers. Results suggest an awareness of lung cancer risk in this group and overall enthusiasm for LCS with tailored and evidence-based approaches but that multi-level barriers may limit patient-provider LCS discussions and therefore uptake of LCS. Further studies to develop and adapt interventions to support LCS in this population are needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Participant demographics of people with HIV who participated in surveys (n=64) and focus groups (n=43).

Characteristic, n (%) or median (IQR)	Survey participants (n=64)	Focus group participants (n=43)
Gender		
Female	10 (16%)	7 (16%)
Male	52 (81%)	35 (81%)
Other	2 (3%)	1 (2%)
Age, median	59 (55–62)	59 (53–67)
Race (participants could select more than one)		
American Indian/Alaska Native	7 (11%)	5 (12%)
Asian	3 (5%)	3 (7%)
Black/African American	7 (11%)	4 (9%)
Native Hawaiian or Pacific Islander	0	0
White	44 (69%)	29 (67%)
Other	8 (13%)	5 (12%)
Hispanic ethnicity	4 (6%)	3 (7%)
Employment status		
Full-time	9 (14%)	7 (16%)
Part-time	13 (20%)	11 (26%)
Retired	9 (14%)	7 (16%)
Unemployed	7 (10%)	3 (7%)
Disabled	26 (40%)	15 (35%)
Other	0	0
Education		
Less than high school graduate	10 (16%)	6 (14%)
High school or GED	16 (25%)	9 (21%)
Some college	19 (30%)	12 (28%)
College degree	15 (23%)	13 (30%)
Graduate degree or professional school	4 (6%)	3 (7%)
Annual household income		
<\$5,000	0	0
\$5,000–15,000	21 (32%)	13 (30%)
\$15,001–30,000	15 (23%)	11 (26%)
\$30,001–50,000	4 (6%)	4 (9%)
\$50,001–75,000	5 (8%)	3 (7%)
>\$75,000	4 (6%)	3 (7%)
Prefer not to answer	5 (8%)	4 (9%)
Don't know	10 (16%)	5 (12%)
Insurance status (participants could select more than one)		

Characteristic, n (%) or median (IQR)	Survey participants (n=64)	Focus group participants (n=43)
Private health insurance/Health Maintenance Organization	22 (34%)	14 (33%)
Medicare	33 (52%)	20 (47%)
Medicaid	26 (41%)	19 (44%)
Charity Care/Subsidized	5 (7%)	5 (12%)
Self-pay	0	0
Smoking status		
Current everyday tobacco use	23 (36%)	13 (30%)
Current occasional tobacco use	5 (7%)	3 (7%)
Former tobacco use	36 (56%)	27 (63%)
Smoking pack-years, median	35 (26–45)	35 (23–44)
Reported previous lung cancer screening	18 (28%)	12 (28%)
Reported other previous cancer screening	42 (66%)	28 (65%)
Reported chronic disease other than HIV necessitating >3 provider visits per year	39 (61%)	28 (65%)

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Table 2.

Joint-display of overarching themes from patient and provider data.

Theme	Representative Patient Quote	Representative provider Quote	Patient quantitative data	Provider quantitative data	Integration comments
Enthusiasm for prevention: High understanding of chronic disease risk in PWH and overall enthusiasm for health screenings	<p>“I think it just important for [PWH] in general to have checkups regularly, or screenings regularly, for things that are important, like lung cancer and other forms of cancer. Because we’re so susceptible.” - 60s, former smoking, unknown LCS^a</p> <p>“I just think that any testing that they can do to prevent us from getting sick is like it’s preventative, it’s like the sooner you find something out the better off you are...” - 50s, current smoking, (+) LCS</p>	<p>“...my patients are enthusiastic about health screenings, like 80 to 85% of them are like...I spend a lot of time taking care of my health, I want to be healthy, and I want to live a long life.”</p>	<p>“My history of HIV impacts my overall health” 84% somewhat or strongly agree</p>		<p>Strong convergence across data sources on chronic disease risk and desire for preventive interventions</p>
Enthusiasm for tailored care: Enthusiasm for dedicated or tailored screening interventions for PWH	<p>“There’s gonna be a little bit difference as to maybe when they start testing, depending on your history, how long you’ve been positive, what your counts have been, whether you’ve had other opportunistic infections, all that other stuff will come into play.” -70s, current smoking, (-) LCS</p>	<p>“We have a lot of other guidance regarding the primary care of [PWH], I think this would fall into that category, it needs to be adjusted. We already do that for women for cervical cancer screening...and I think we should adjust the lung cancer screening guidelines as well.”</p>	<p>“I want healthcare information designed for persons living with HIV” 97% somewhat or strongly agree</p>	<p>“Healthcare guidelines should be tailored to people with HIV” 100% somewhat or strongly agree</p>	<p>Strong convergence across data sources that interventions which provide tailored data or recommendations for PWH are preferable Providers more likely to cite adapting screening guidelines for PWH</p>
Impact of HIV on lung cancer: High awareness of high tobacco use and high lung cancer risk in PWH, less awareness of association between HIV and lung cancer independent of smoking	<p>“I heard way back in the early days about the link between lung cancer and HIV, being more prevalent and predominant in people with HIV and AIDS, and that smoking was one of the big no-no’s you know, for people in my situation.” -50s, former smoking, (-) LCS</p>	<p>“There seems to be a trend that people living with HIV...appear to be at greater risk for other cancers, even with well controlled HIV.”</p>	<p>“My history of HIV puts me at higher risk for lung cancer” 86% somewhat or strongly agree</p>		<p>Strong convergence across data sources that PWH are at higher risk for lung cancer</p> <p>Providers more aware of independent association between HIV and lung cancer while patients thought exclusively related to smoking</p>
Patient relationship to provider and health system: Screening decisions are often nested within trusting patient-provider relationships; though a few patients report medical skepticism rooted in HIV history	<p>“I gotta hear it from my doctor, and if they recommend that I don’t have it, then I don’t have it, if they recommend that I do then I will.” -50s, current smoking, (-) LCS</p> <p>“Remember the early early days of HIV and experimentation with drugs, the side effects were just atrocious and horrific on a lot of people, and so a lot of [PWH] decided ‘no I’m not going to take the medication’. Some of it is very similar to the attitude today” -60s, former smoking, (-) LCS</p>	<p>“...because these are folks that I typically have some relationship with. So luckily, it’s not somebody I’m just seeing one time and having to explain like a screening result.”</p>	<p>“I follow my provider’s recommendations on which healthcare services to get” 98% somewhat or strongly agree</p> <p>“If my provider recommended lung cancer screening, I would get it.” 100% somewhat or strongly agree</p>		<p>General convergence on the importance of long-standing and trusting relationships</p> <p>Divergence noted in a few patients who reported skepticism towards recommended health services based on negative experiences with previous prognoses and treatments</p>

Theme	Representative Patient Quote	Representative provider Quote	Patient quantitative data	Provider quantitative data	Integration comments
Knowledge of LCS: Knowledge and experience with LCS is lower than other screening modalities among PWH and their providers	“I hadn’t realized before that it was actually a CT scan for the [screening], I thought it was x-ray or some other test.” - 60s, former smoking, (-) LCS	“The criteria for screening are a little bit challenging, I have to look them up every time”	“My healthcare provider has recommended I get lung cancer screening” 48% somewhat or strongly agree	“I am very familiar with lung cancer screening guidelines ” 100% somewhat agree, 0% strongly agree	Convergence on limitations in knowledge Providers are more knowledgeable of LCS than patients
Financial barriers: Issues of cost and coverage are identified as common barriers by patients and providers	“If doctor highly recommend[ed] to do scanning, to see how...my lung doing...I’d probably say oh ok, and the cost of course, cost a big thing, right?” -50s, current smoking, (+) LCS	“I think people are concerned about cost and whether or not they’re going to end up with a bill from this so I’m not as well versed about this portion of healthcare for patients”			Convergence between patients and providers on cost/coverage as barriers to LCS

^a Patient quotes are followed by age (decade of life), smoking status, and self-report of prior lung cancer screening

Abbreviations: LCS=lung cancer screening; PWH=people with HIV

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Table 3.

Joint-display of themes from patient data.

Theme	Representative Patient Quote	Patient quantitative data	Integration comments
Impact of smoking cessation: For many PWH who had quit smoking, a “teachable moment” related to their health led to effective cessation	“...for the longest time I even smoked on Chantix too so, and then I got a cancer scare and that just kind of did it right there, so I just put them down after that” -50s, former smoking, (-) LCS ^a		Convergence among PWH who had successfully quit smoking that experiences and attitudes related to their health led to a successful quit attempt
Support for evidence: In supporting approaches to LCS in PWH, patients want an evidence-based and data-driven approach	“I think we are much more aware of our health care needs, and concerns and are much more aware of how we are doing and what we need to worry about than most people.” - 50s, former smoking, (-) LCS	“I want to understand how my HIV impacts my risk for other diseases” 98% somewhat or strongly agree	Strong convergence on importance of evidence and data
	“I think [screening] should be tailored to what the research is showing that we’re most vulnerable for.” -60s, former smoking, (+) LCS		
Importance of survivorship: Perceptions of survivorship at HIV diagnosis may have related to fatalism around tobacco use in the past, but narratives that support ongoing survival and health are important to health decisions in PWH	“I never thought I would turn 25, which is the reason that I drank and smoked and did a lot of the drugs, because I was for sure going to die, so the fact that I’m still here and I’ve been smoke free for eight years, you know, the life we have no idea.” -50s, former smoking, (-) LCS		Convergence on changing relationship to health with aging and HIV

^aPatient quotes are followed by age (decade of life), smoking status, and self-report of prior lung cancer screening (LCS)

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Table 4.

Joint-display of themes from provider data.

Theme	Representative Provider Quote	Provider quantitative data	Integration comments
Barriers to prevention: Providers are not discussing lung cancer screening with all eligible patients; identified major barriers to all cancer screening and prevention include patients' acute issues, multimorbidity, mental health issues and other substance abuse	"You know people have only so much bandwidth and if they're busy going to multiple doctors appointment to manage their diabetes or their substance abuse or their mental health...it's a little tough to say Well, you know why don't you also get lung cancer screening."	"Patients with significant comorbidity do not benefit from lung cancer screening" 82% somewhat or strongly disagree "I discuss lung cancer screening with all my patients who are eligible" 28% somewhat disagree	Convergence across data sources on barriers related to prevention efforts Some divergence among providers on whether highly comorbid and complex patients benefit from prevention efforts
Specific LCS barriers: Providers noted additional barriers to lung cancer screening scheduling, access, complexities of eligibility and the requirement for providers to perform shared decision making	"...there's a big drop off just in sort of the they leave the office and get told they'll be called by radiology or they need to call a number and the completion rate is just a lot lower than we would hope." "Not knowing the pack years, that's super annoying. I mean, it would be better if they had to check the box that was like, do they have more than x pack years?"	"I need additional tools to discuss lung cancer screening with my patients" 82% somewhat or strongly agree	Convergence across provider data sources on additional barriers to LCS
LCS prioritization: Providers have an overall positive view of LCS and its importance, though it falls below the priority of acute issues and primary prevention efforts around cardiovascular disease or active smoking	"I tend to sort of go in order of priority of untreated things that have a big impact. So if somebody has, you know, uncontrolled cardiovascular disease or cardiovascular risk factors, or is actively smoking...those other things I usually work on those things first"	"Lung cancer screening has more benefits than harms" 82% somewhat or strongly agree "Cigarette smoking is a major problem for people with HIV" 91% strongly agree vs. "Lung cancer is a major problem for people with HIV" 36% strongly agree	Convergence on LCS as a lower priority relative to other preventive care across provider data sources

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