

Physician Preferences for an Electronic Lung Cancer Screening Decision Aid

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Lung cancer is the second most common cancer for both men and women in the US.¹ Nationally, an estimated 238,340 new lung cancer cases and 127,070 lung cancer deaths were predicted for 2023.² Population-based studies have estimated that more than 12,000 lung cancer deaths could be prevented every year if patients aged 50 to 80 years who currently smoke or have a significant smoking history undergo annual lung cancer screening (LCS) via low-dose CT scan.³ Despite the clear disease burden of lung cancer and the known clinical benefit of screening, LCS is currently underutilized among eligible patients. The American Lung Association estimates that only 5.8% of eligible high-risk patients undergo annual screenings nationally.⁴ A patient's decision to undergo LCS is ultimately a personal one, and there are a variety of reasons a patient may choose to not undergo LCS.⁵⁻¹¹ Potential harms of LCS include radiation exposure, complications from invasive procedures, and overdiagnosis of patients unlikely to benefit from lung cancer treatment.⁶⁻¹¹ Illness anxiety has also been shown to play a role; one qualitative study of 18 eligible participants who opted out of LCS found that fear of positive results factored into their decision.⁵ Other reasons for declining LCS include medical comorbidities, perceived likelihood of risks,⁶⁻⁸ and social or logistic concerns.⁹⁻¹¹

Low rates of LCS also reflect the referral practices of primary care providers (PCPs).¹²⁻¹⁴ One study evaluating more than 53,000 appointments with more than 8000 patients who presented for primary care at an academic community hospital found that referral rates of eligible patients for LCS were inconsistent and highly dependent on the PCP seen at the visit.¹³ Another study surveyed 1384 PCPs and found that the frequency at which PCPs initiated conversations about LCS with eligible patients was significantly associated with providers' personal beliefs about the associated benefits.¹² Decision aids (DAs) represent a guideline-concordant method to standardize LCS discussions,^{12,13} promote patient-provider shared decision-making, and lead to more patient-centered decisions.^{14,15} DAs are tools designed to help promote and navigate shared decision-making conversations between provider and patient.¹⁶ They provide information about screening options

ABSTRACT

OBJECTIVE: To present primary care physician (PCP) suggestions for design and implementation of a decision aid (DA) tool to support patient-provider shared decision-making on lung cancer screening (LCS).

STUDY DESIGN: Semistructured interviews were conducted with 15 PCPs at an academic medical center.

METHODS: The deidentified transcripts were independently coded by 2 study interviewers and jointly reviewed every 5 interviews until we determined that data saturation had been achieved. We then identified themes in the data and selected illustrative quotes.

RESULTS: Three main themes were identified: (1) make it brief and familiar (make the tool user-friendly and implement a similar format to other widely used DAs); (2) bring me to automation station (limit busywork; focus on the patient and on the decision); and (3) involve the patient (facilitate patient involvement in the DA with simple language, visual aids, and bullet-point takeaways).

CONCLUSIONS: Findings contain concrete suggestions by PCPs to inform usable and acceptable LCS DA tool design and implementation. For an LCS DA to be most successful, PCPs emphasized that the tool must be easy to use and incorporate autopopulation functions to limit redundant patient charting.

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TAKEAWAY POINTS

In qualitative interviews, primary care physicians presented suggestions for the design and implementation of an effective decision aid tool to assist patient-physician shared decision-making conversations on lung cancer screening.

- ▶ Primary care physicians noted that decision aid tools could be useful in shared decision-making conversations with patients about lung cancer screening.
- ▶ The tool should be brief and easy to use, have automatic reminders at screening follow-up times, and involve the patient.
- ▶ Automatic functions that input data from elsewhere in the patient chart (eg, patient age, smoking status, pack-years) to determine lung cancer screening eligibility would create more time for shared decision-making conversations during clinic appointments.

and associated risks and benefits.¹⁶ Importantly, they prompt the asking of purposeful questions on goals of care to make decisions holistic—both medically informed and reflective of patients' personal values and needs.¹⁶

DAs have been shown to not only increase the rate of physician-patient discussions about cancer screening but to also have the potential to increase the rate of cancer screening tests in outpatient care centers more broadly. An analysis of the National Ambulatory Medical Care Survey showed that outpatient centers that routinely used DAs had higher rates of screenings for all cancers among their eligible patient populations.¹⁷ Specific to LCS, a literature review of DA pilot programs (N = 15 programs) found LCS DAs to be well received by eligible patients; the majority of studies examined in that review found LCS DAs had high acceptability rates as reported by patients.¹⁸ One study reported that after presenting individuals enrolled in a tobacco treatment program with an LCS video-based DA, 90% of patients stated they were now planning to bring up LCS at their next PCP appointment and that the video had an impact on their decision.¹⁹ In 2020, *Chest* published a white paper call to action informed by a roundtable discussion of physicians, asking developers to expand LCS-focused software for electronic health records (EHRs) to include tools capable of screening for eligibility and calculating risk.²⁰ The white paper strengthened interest in creating an LCS DA accessible by EHR because doing so could improve the frequency of PCPs initiating shared decision-making conversations.^{12,13,17,21}

Importantly, for a DA to increase rates of LCS decision-making conversations, it needs to be used. Studies show that the design of a DA can impact how often it is utilized.^{17,21} For example, one pilot study tested a new DA on 336 LCS-eligible patient charts and found that 62% of the pack-year histories documented in the EHR system by PCPs were incompatible with the DA and that, consequently, the tool did not identify the patients as eligible and alert their providers.²¹ PCPs' attitudes toward DA use also play a role. Studies find that many PCPs do not frequently use LCS DAs, with reasons cited including logistical concerns, lack of confidence regarding benefits of screening, and difficulty interpreting results generated by the DA.²²⁻²⁶ A few programs piloting EHR-based LCS DAs found that although PCPs were initially enthusiastic about their utility,

ultimately the tools went unused.²²⁻²⁶ Exit reports showed that some PCPs were frustrated by steep learning curves to master DA use and that other PCPs reported forgetting about its availability.^{22,25,26}

The extant literature on LCS DAs highlights the design features that have led to poor implementation and usability^{19-22,25,26}; few studies provide information on how to create a tool for PCPs that will be well liked and well used. In this study, we conducted qualitative interviews with PCPs at our medical center to learn about their thoughts, preferences, and perceived

barriers and facilitators regarding the design and implementation of an EHR-based LCS DA.

METHODS

We conducted qualitative, semistructured interviews with 15 PCPs between October 2020 and February 2021. The PCPs were attending-level physicians practicing at 4 general internal medicine outpatient clinics affiliated with the Mount Sinai Health System in New York, New York. Mount Sinai Health System clinics service a dense urban population and have large clinical caseloads. The PCPs were identified from the faculty roster, and a research study coordinator then reached out to explain the study and obtain consent. Once consent was obtained, PCPs were enrolled in the study. The included PCPs were recruited to be participants in a larger study to develop an LCS DA tool. For the full qualitative interview materials and additional details on study design and research methods as well as for information on study participant characteristics, please consult Kale et al.^{27,28} The study was approved by the Icahn School of Medicine at Mount Sinai Institutional Review Board.

PCPs were all part of a health system with an EHR (Epic) utilizing best practice advisories, clinical decision support (such as cardiovascular risk calculation), and patient education materials. We asked PCPs to tell us about their experiences with overall DA use in clinic, to highlight which components of other EHR tools were helpful and which components were not as helpful, and talk to us about why. Participants were asked which features a DA would need to have for it to be routinely used by PCPs during clinic.

Interview transcripts were imported into Dedoose software (Dedoose). Thematic analysis followed qualitative methods outlined by Braun and Clarke.²⁹ Study investigators (M.S.K. and J.B.S.) reviewed deidentified transcripts and generated initial codes independently. Every 5 interviews, study investigators would meet to jointly assess code frequency and accuracy. The protocol was then repeated for the next 5 transcripts until thematic saturation was determined, after which point study investigators met to determine themes and select illustrative quotes on each theme. At the end of the study, a third study-team member (O.M.) reviewed the relevant DA themes to confirm each was unique and internally consistent.

RESULTS

Fifteen PCPs were interviewed. The frequency with which PCPs accessed decision support tools in the EHR varied, as did their perspectives about the benefits of using an LCS DA with patients. Three main themes were identified describing qualities that would optimize the utility and efficacy of an LCS DA: (1) make it brief and familiar, (2) bring me to automation station, and (3) involve the patient. In addition, we identified subthemes, which elaborated on the constructs within each theme. Demographic information on the PCP participants can be seen in **Table 1**. Quotes illustrating themes and subthemes can be found in **Table 2**.

Theme 1: Make It Brief and Familiar

The PCPs explained that although they were enthusiastic about the idea of an LCS DA, there were practical limitations that might impede the tool from being routinely used. These limitations included the quick pace of patient appointments in their primary care practice as well as the learning curve required for new tools. This theme has 2 subthemes: (1a) do not reinvent the wheel and (1b) design it for a busy clinic day.

Theme 1a: Do not reinvent the wheel. PCPs emphasized that there are many tools in the EHR system and that some are more highly used than others. Building the new DA based on features of other highly utilized DAs and screening calculators will make it easier to incorporate because its format would be familiar. PCPs noted certain tools embedded in the EHR that they routinely use and like the format of, such as the atherosclerotic cardiovascular disease 10-year risk estimate tool, the Patient Health Questionnaire-9, the Generalized Anxiety Disorder 7-Item questionnaire, and a tool for assessing whether they should order a Cologuard colon cancer screening kit. Other PCPs suggested that the DA appear after tobacco history is filled in when the patient meets eligibility criteria for LCS, resembling the way a nutrition education tool appears in the EHR when height and weight are filled in and the patient is above a certain body mass index. Similarly, avoiding features of tools that have not been well adapted to everyday use could also be informative. For example, one PCP referenced a tool they liked to use but stopped using because it underwent format updates too frequently. The PCP noted that new features and pop-ups are frustrating rather than helpful because each time they had to relearn how to use the DA.

Theme 1b: Design it for a busy clinic day. The PCPs we spoke with emphasized that they would ideally give detailed screenings to every patient. Unfortunately, they reported that the constraints of a busy primary care practice do not allow for lengthy shared decision-making discussions during patient appointments. The physicians suggested creating a tool that is quick and time-saving so that what little time they do have with each patient can be better leveraged to address the specific needs and fundamental goals of LCS. They also reported that the tool should be designed for easy use on busy clinic days.

TABLE 1. Physician Participants' Self-Reported Demographic and Professional Characteristics (N = 15)

Characteristic	n (%) or mean (SD)
Age in years, mean (SD)	47 (14)
Female, n %	9 (60%)
Race,* n (%)	
White	11 (73%)
Black or African American	1 (7%)
Asian	1 (7%)
Latinx/Hispanic, n %	3 (20%)
Years in practice, mean (SD)	15 (14)
Number of LDCT scans ever ordered, mean (SD)	70 (75)
Where LCS education was received, n (%)	
Medical school	5 (33%)
Grand rounds	7 (47%)
Continuing education	10 (67%)
Other	3 (20%)

LCS, lung cancer screening; LDCT, low-dose CT.

*Participants could select more than 1 race.

Theme 2: Bring Me to Automation Station

The PCPs interviewed pointed out that if the tool removed the busywork of typing patient information to set up the DA, it would enable them to better focus both on the patient and on the decision, rather than on proper setup of the tool. If filling out the DA would involve retyping information already in the chart, they would not want to waste precious time with the patient inputting these redundancies. In addition, PCPs noted that even if the DA is helpful, it is easy to forget that it exists without automated reminders. This theme has 2 subthemes: (2a) plug in the numbers and (2b) program in a reminder.

Theme 2a: Plug in the numbers. Having autofilled boxes and charts that are prepopulated with patient data located elsewhere in the EHR can not only be time-saving but also would help patient-physician communication when discussing LCS options. Having autopopulation limits redundant information input and prevents physicians from asking the same question multiple times. The PCPs noted that it breaks down communication flow when simple questions such as tobacco use history must be asked every time the DA is used. Having automatically populated histories in the DA would bypass this step.

Theme 2b: Program in a reminder/forcing-function pop-up to discuss. Automation could also involve automated reminders and pop-up screens at certain appointments when the patient meets criteria or is due for a follow-up appointment. The interviewed physicians emphasized that having reminders and pop-up screens can help them remember to use the DA during the appointment. Having preset reminders that keep track of when the patient is due for LCS can also act as a forcing function for physicians to use the DA.

TABLE 2. Themes, Subthemes, and Illustrative Quotes

Subtheme	Illustrative quotes
Theme 1: Make it brief and familiar	
1a: Do not reinvent the wheel	<p>“Sort of like a calculator where you can even go through with the patient and calculate like pack-year history, other comorbidities, whatever, and...in front of their eyes they can see why you’re making this decision, I think would be helpful. I do a lot with...the ASCVD 10-year risk calculator, and I think it’s really helpful.”</p> <p>“I will use the SmartSet for things like BMI if I’m looking for the healthy plate and a list of foods and how people gained weight, right? So if it’s embedded, then I know.”</p> <p>“I go on MDCalc all the time with patients. I’ll use the ASCVD 10-year risk [calculator]. I do that all the time with patients. I’m comfortable with going to an external source and just pulling it up on the computer.”</p> <p>“I think [a decision aid tool in the EHR] would be fabulous. Because I do it sometimes with the cardiac risk score, especially [for] my patients who smoke. And if you calculate their ASCVD score and then you take smoking out as a variable and they see how significantly their 10-year risk declines, it’s extremely powerful. So I think if there was some sort of a tool—whether it’s an app or whether it’s something linked to Epic.”</p> <p>“For example, when we order Cologuard for colon cancer screening,...then there’s a phrase that I can put into the instructions that basically tells the patient what to expect next, or in the reference, information that you can give patients, like patient education topics.... I don’t even know if it exists for lung cancer screening, actually, but if it doesn’t, that would be nice.”</p> <p>“I know [an LCS DA tool in the EHR] exists; I never use it. I think if it were a link in Epic or somehow incorporated into the note like the PHQ-9 or GAD-7 [questionnaire] and you just click a button and it unfolds, then I would be more open to it. I find there are so many things to do during the course of the visit that searching for a [DA] before having to go through it with the patient is just a lot.”</p>
1b: Design it for a busy clinic day	<p>“At the end of the day, our schedules are packed back-to-back. If something is going to end up taking a lot more of our time, it’s going to put us even [further] behind and people probably are not going to use it.”</p> <p>“I think if [the screening tool] can blend in, be easy to use, and be relatively quick to reference, then that would work.”</p> <p>“...For me, I guess something that’s easily accessible and not something that I have to spend 15 minutes searching for in Epic. So I don’t know exactly how you do that, but...something that’s easily accessible.”</p> <p>“It’s certainly more time efficient in the moment to just sort of check the boxes.”</p> <p>“Yes, just really quick and basic. You know, [here are] the benefits of this, here are the risks, and boom, like nothing complicated.”</p> <p>“I think the availability is the issue for me, not the form or the format. So Epic, paper, or whatever...if [it] were available next to me, I would refer to it quite frequently, but it just needs to be there.”</p> <p>“I feel like I love the idea of [DAs]. I don’t ever really use them. Well, Mayo Clinic has one I sometimes used.... I think for me the barrier was it’s never readily available.... When I click the [DA] button, there is an extra click, then a pop-up, then they have updated it...”</p>

(continued)

Theme 3: Involve the Patient

The PCPs noted that although the DA could be in the EHR, which is used by the physician to record patient notes, that does not mean the tool can, or should, be used only by the physician. The tool could act as a resource to employ and enable patient-physician communication and decision-making strategies. To help facilitate this, the DA should use simple language and have visual aids and bullet-point takeaways so that it can be used for patient education and as an easy jumping-off point for further discussion. As noted earlier, because during the visit there typically is not sufficient time to explain the nuances of LCS in detail and to answer all patient questions, having prescreening questionnaires done by patients before appointments could allow the time with the physician to be more targeted—ie, time could be spent on the patient’s concerns and questions and to discuss pros and cons of LCS specific to the patient. In addition, having pamphlets and printouts of the DA would

enable patients to read and learn more about the screening protocol after the appointment and provide them with further resources to engage with in case providers run out of time in the clinic.

DISCUSSION

Currently, the US Preventive Services Task Force (USPSTF) recommends that individuals aged 50 to 80 years with a smoking history of 20 pack-years who currently smoke or who have quit within the past 15 years be screened for lung cancer with annual low-dose chest CT scans.³ The USPSTF also encourages PCPs to engage patients in LCS shared decision-making conversations.³ DAs streamline shared decision-making conversations, offering a clear potential benefit to PCPs and LCS-eligible patients.^{16,17,19} A randomized controlled trial (RCT) found that a colorectal cancer screening DA that included personalized cancer risk scoring functions increased patient

TABLE 2. (Continued) Themes, Subthemes, and Illustrative Quotes

Subtheme	Illustrative quotes
Theme 2: Bring me to automation station	
2a: Plug in the numbers	<p>"It would be nice if there was a way to link. If the patient already [has] 30 pack-years plus and agrees with and would like to pursue low-dose CT lung cancer screening, then when I put in the order, I don't want to have to then go through and...type everything just to say how many pack-years. I would love it to just populate everything."</p> <p>"Epic is something that I'm already doing, so it would be nice if something like that autopopulates for people who are—is it 50 or 55?"</p> <p>"The most useful thing would be a combination of a BPA that is perhaps even triggered by patient-inputted data on smoking history that then links to a SmartSet that includes all the shared decision-making points and then the orders for the CT."</p> <p>"...If there were something that took in account their tobacco history, right, and [identified] people who would be eligible, and [took] into account other clinical barriers that might stratify into 'more likely' or 'less likely' to benefit from screening, that would be helpful."</p> <p>"Screening for lung cancer is the diagnosis code or if I order the CT scan, maybe something can pop up automatically with that order or with that diagnosis code. That would be really easy."</p> <p>"When you order up, for example, the CT scan right now for lung screening, they ask you several questions. If there was like a section where I can just click 'lung cancer screening' in the tobacco section, and it pulls up an order, and then you answer the questions in the tobacco section—because we all go into that anyway—[and then] it populates the order because they meet the criteria, that'll be quick and easy."</p>
2b: Program in a reminder/ forcing-function pop-up to discuss	<p>"I really use health maintenance as my guide to the major screenings, so putting a prompt there that would alert me to [LCS] as a potential opportunity would be helpful."</p> <p>"So BPAs—an accurate BPA that clearly defined eligibility that I could rely on when putting in the health maintenance."</p> <p>"It'd be really helpful if there was some tracking function once it was done. Just like you can say, for colonoscopy, when the next colonoscopy is, or you can say either 6 months or 12 months. Something that reminds you when it's due."</p> <p>"Opportunities to screen are being missed because I'm not being prompted [based on] proper age and tobacco history."</p> <p>"What makes sometimes the in-your-face reminders really helpful for some of these screening tests is that they force everybody who comes across the chart, particularly primary care providers, to be aware that their patient qualifies for this particular screening test."</p> <p>"So we're going to have to address [LCS] no matter what. So if it was sort of like, 'red light': If someone was a smoker, then it will ask you to click off the questions. I think that'll be easy to do."</p>
Theme 3: Involve the patient	
—	<p>"Like something more simplified and not too scary for the patients just because some people are iffy about things, and everybody wants to read up on the internet. But the internet has a lot of conflicting information, so it's not that great. So I think [DA tools are] helpful. My patients do like handouts. Sometimes they forget things that I mentioned to them, so it's nice if they can just look at something and be like, 'Oh, OK. Sure.'"</p> <p>"Something that is easily printed out at the point of care and given to patients to read.... I use the educational tools in Epic a lot. I don't know if there is one there about lung cancer screening."</p> <p>"I think that's helpful, to do [the screening tool calculation] sort of with the patient. So something that would be patient-friendly and I guess easily brought into the note."</p> <p>"I could [be with the patient], and I can display [the screening tool] physically on the screen.... That's always valuable."</p> <p>"I do find that attaching [educational materials] to the AVS is useful because I do tend to attach a lot of stuff to there. I do think patients reference it a lot. For example, I [had] a 30-minute discussion on ACE inhibitors yesterday. Then after, my patient still wasn't convinced, so I gave him just like an educational packet in the AVS, and he was looking forward to going back and just reading it more on his own time."</p> <p>"Something...that visualizes what it is that you want to say because a lot of patients might not necessarily be as good with numbers."</p> <p>"One of those pieces could be the patient fills it out in a previsit planning kind of format."</p> <p>"You could give [educational materials] to the patient [to] let them think about it more after you've had the discussion....So something that would help stratify...'more likely to benefit' [and] 'less likely to benefit' and a tool to help order it would be helpful."</p>

ACE, angiotensin-converting enzyme; ASCVD, atherosclerotic cardiovascular disease; AVS, after-visit summary; BMI, body mass index; BPA, best practice alert; DA, decision aid; EHR, electronic health record; GAD-7, Generalized Anxiety Disorder 7-Item; LCS, lung cancer screening; PHQ-9, Patient Health Questionnaire-9.

adherence to colorectal cancer screening 3-fold above rates in the control arm.³⁰ Surveys have found that when PCPs routinely used the decision support tools, such as DAs, available in the EHR, rates of patient adherence to all types of cancer screenings increased.³¹

Despite interest in LCS DAs to promote shared decision-making conversations, numerous barriers have been identified to the implementation of such aids. A review of the literature on LCS DA pilot programs found that post-EHR implementation reports of frequency of in-clinic DA use by PCPs showed mixed success and that no RCTs in the review found DA use to improve LCS rates vs a control arm.¹⁸ However, in 2023 an RCT was conducted with 140 participants and found that DA use did increase LCS rates vs a control arm.³² Such varied results may indicate that outcomes hinge on the design of the DA and perhaps whether it is included in the EHR. Studies have shown that pop-up reminders, automated dashboard messages, and changing EHR settings to have *referral* as the default order increased patient referral rates and, subsequently, screening rates for multiple types of cancer screenings.³³⁻³⁷

Limitations

Our study has several limitations. Participants were clinicians from a single academic medical center, limiting geographic diversity. However, given the near ubiquity of EHR use in clinical settings, our findings provide insight on how DAs could be successfully implemented in busy outpatient primary care settings.³⁸ Future pilot trials should thus use this information to guide development of user-friendly DAs with the highest likelihood of implementation. Doing so will better enable joint physician-patient decision-making concerning LCS and has the potential to improve LCS rates.

CONCLUSIONS

When programming a DA to be used in an outpatient clinical environment, it is important to consider design preferences of PCPs to maximize the DA's chance of widespread use. A survey of 50 outpatient health centers reported that 73% of their PCPs found DAs and DA reminders cumbersome and not realistic for use in a busy medical clinic.³⁹ Qualitative interviews of PCPs in other shared decision-making contexts (eg, pelvic organ prolapse conversations) showed that PCPs were enthusiastic about the idea of a DA to assist with patients; however, logistical barriers to use, such as remembering that the DA exists and where in the EHR it is located, prevented them from actually using the tool.⁴⁰ Although there is ample literature identifying the barriers to DA implementation, our study is unique in that we report on the solutions that PCPs propose to facilitate implementation, which could inform DA design, feasibility, and usability. Importantly, the PCPs in our study pointed out DA designs that could overcome obstacles documented by previous literature. For example, the PCPs suggest the DA be quick to overcome the time pressures of a busy clinic. They also recommend the DA be easily seen and readily accessible in the EHR so PCPs remember the tool exists. By our interviewing PCPs about what would make them

more likely to use a DA, our study not only provides insight into the obstacles of implementing a DA but also provides solution-oriented perspectives to help make a successful tool. ■

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