Evaluation of a Personalized, Web-Based Decision Aid for Lung Cancer Screening

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Introduction: Informed decision making has been highlighted as an important aspect of lung cancer screening programs. This study seeks to assess the efficacy of a web-based patient decision aid for lung cancer screening, www.shouldiscreen.com.

Methods: A before-and-after study (August through December 2014) was conducted where participants navigated a web-based decision aid that provided information about low-dose computed tomography lung cancer screening. Using an established prediction model, the decision aid computed baseline lung cancer risk and an individual's chances of benefiting from, and risk of being harmed by, screening. Outcome measures included knowledge of lung cancer risk factors and lung cancer screening, decisional conflict, concordance, and acceptability of the decision aid. Data were collected from 60 participants who were current or former smokers, had no history of lung cancer, and had not received a chest computed tomographic scan in the previous year. Analysis took place in 2015.

Results: Knowledge increased after seeing the decision aid compared with before ($p<0.001$), whereas the score on the Decisional Conflict Scale decreased ($p<0.001$). Concordance between a participant's preference to screen and the U.S. Preventive Services Task Force recommendation improved after seeing the decision aid ($p<0.001$). Risk perceptions among the screen-ineligible group changed ($n=49$), contrary to those who were eligible ($n=11$). Ninety-seven percent of the participants reported that the decision aid was likely useful for lung cancer screening decision making.

Conclusions: The web-based decision aid should be a helpful resource for individuals considering lung cancer screening, as well as for practitioners and health systems with lung cancer screening programs.

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Introduction

Lung cancer screening (LCS) programs are being implemented across the U.S. following evidence that low-dose computed tomographic screening can significantly reduce lung cancer mortality.[1] Population-wide screening is most efficient if high-risk individuals, who are most likely to benefit, are identified and encouraged to screen, whereas those who are less likely to develop lung cancer are discouraged.

Decision aids (DAs) improve decision quality by helping users understand the pros and cons of available options, decrease decisional conflicts, and potentially prevent underuse or overuse of screening services.[2–5] The Centers for Medicare and Medicaid Services made shared decision making a requirement for LCS reimbursement, recommending the use of one or more DAs to facilitate the shared decision-making process.[6] The authors' DA complies with Centers for Medicare and Medicaid Services requirements in terms of content: benefits and harms of screening, follow-up diagnostic testing, overdiagnosis, false positive rate, and total radiation exposure.[6] However, with LCS being a relatively new

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screening procedure, there is a paucity of DAs available. To the authors' knowledge, only one DA has been peer-reviewed to date.[7] Moreover, current DAs[7–11] do not consider individual characteristics and only provide average risks and benefits of LCS. Precise risk prediction should be a critical part of LCS because clinically important differences in benefit exist even among screen-eligible individuals.[12]

The authors developed a web-based DA that provides individual estimates of lung cancer risk, and screening benefits and harms. They then tested its efficacy with current and former smokers aged 45–80 years.

Methods

Study Sample

An uncontrolled, before-and-after study was conducted with 60 participants to assess the efficacy of the DA (August through December 2014). A sample size of ≥ 52 was calculated to detect a 20% improvement in knowledge assuming an initial mean of 7.8 (score of 60%), with power of 0.8. Participants were a convenience sample of volunteers who were current/former smokers, aged 45–80 years, with no previous history of lung cancer and no chest computed tomographic scan in the previous year at the time of recruitment. Of all eligible subjects who initially expressed interest in the study, 60% enrolled. The study was approved by the University of Michigan IRB.

Data Collection

Eligible participants were invited to answer a survey administered via Qualtrics (www.qualtrics.com) at the University of Michigan. Participants were asked to complete a "Before" survey and were then redirected to the study website. Subsequently, participants were directed to the "After" survey. Surveys used along with additional details on the development of the DA are described elsewhere.[13] The International Patient Decision Aid instrument version 4.0 checklist[14] and current risk communication best practices were used in the development.[15–17] The current version of the DA is available at www.shouldiscreen.com.

Measures

Study outcome measures were adapted from the Ottawa Decision Support Framework[18]: knowledge of LCS benefits and harms, decisional conflict,[19] and acceptability.[20] The ten-item Decisional Conflict Scale is composed of four subscales: Uncertainty, Informed, Values Clarity, and Support. A total score of 0 indicates no decisional conflict, to 100 showing extremely high conflict. Concordance was also measured between the U.S. Preventive Services Task Force (USPSTF) recommendation[21] and an individual's preference as assessed by the question *Which option do you prefer now in terms of lung cancer screening?* Participants who answered *I prefer to screen* and were also eligible for screening based on USPSTF criteria were deemed "concordant," as were participants not eligible for screening who preferred not to get screened. Lastly, participants' risk perception was measured.

Statistical Analysis

Wilcoxon signed-rank test and McNemar's exact test were used to compare the before/after continuous and binary outcomes, respectively. All analyses were performed in 2015 using Stata, version 13.

Results

The average participant was aged 60.6 years, half were male, 27% were current smokers, and 18% fulfilled the USPSTF's eligibility criteria for screening (Table 1). The average 6-year lung cancer risk was 0.012 (PLCOm2012 model[22]). Average time spent on the study website/DA was 10 minutes.

Table 2 provides before/after changes for knowledge, decisional conflict, and concordance. Knowledge for all questions improved significantly after viewing the DA ($p < 0.001$). Most people were not aware that the majority of lung nodules detected by computed tomography are not cancer. Appendix Table 1 (available online) presents specific items that were asked.

The mean overall Decisional Conflict Scale score was 46.33 (SD=29.69) prior to viewing the tool, and 15.08 (SD=25.78) after ($p < 0.001$, before/after difference). All subscales showed significant decreases ($p < 0.001$) and

Table 1. Characteristics of Participants [Number of Participants (%)]

	Total (N=60)
Age[a]	60.6 (7.3)
Male	30 (50%)
Race	
Black	7 (12%)
White	53 (88%)
Education	
Less than high school	1 (2%)
High school graduate	4 (7%)
Some training after high school	4 (7%)
Some college	13 (22%)
College graduate	17 (28%)
Postgraduate or professional degree	21 (35%)
Eligible for screening by USPSTF criteria	11 (18%)
Current smoker	16 (27%)
Quit >15 years ago	30 (50%)
Pack-years[a]	24.08 (23.85)
Have heard about lung cancer CT screening (other than from study)	28 (47%)

[a]The mean and SD were expressed for age and pack-years.
CT, computed tomography; USPSTF, U.S. Preventive Services Task Force.