

Eye Tracking while Assessing Cancer Risk

FedCASIC 2019 Workshops

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Agenda

1. *Introduction and Tools*
2. *Method Summary*
3. *Eye Tracking for Observational Purposes*
4. *Impact*

Introduction and Tools

Introduction

- Melanoma Risk Assessment Tool (MRAT)
- Breast Cancer Risk Assessment Tool (BCRAT)
- Colorectal Cancer Risk Assessment Tool (CCRAT)
- The ten participants were clinicians who discuss information about cancer or cancer education with patients
- The UX testing incorporated eye tracking to allow those who were viewing live sessions to see where the participants were looking as they interacted with the tools on the desktop computer
- Eye-tracking for observational purposes only

Cancer Risk Assessment Tool: Research Questions

- The intended audience is clinicians who discuss information about cancer or cancer education with patients, patients, and people interested in assessing their risk of cancer.
- How can we make the risk assessment tools easier to use?
- How can we best write the questions so they are clear and easy to understand?
- How can we best use visuals and graphics to present results?

NCI Audience Research Lab



Melanoma Risk Assessment Tool: Introduction Page

The Melanoma Risk Assessment Tool

The Melanoma Risk Assessment Tool was developed for use by health professionals to estimate a patient's absolute risk of developing invasive melanoma. Absolute risk is the likelihood that a person will develop a specific type of cancer over a certain period of time, in this case 5 years.

Although an individual's risk may be accurately estimated, these predictions cannot precisely determine who will develop melanoma. If you are not a health professional, you are strongly encouraged to discuss your results and personal risk of melanoma with your doctor.

[Assess Patient Risk](#)

The Melanoma Risk Assessment Tool was developed using data from a large case-control study in the United States. Risks are estimated for non-Hispanic whites only between 20 and 70 years of age. Data for other races/ethnicities are too limited to accurately estimate risk.

Patients who have had one of the following diagnoses should be in screening and surveillance for melanoma and should not use this tool to estimate their risk:

- Melanoma
- Melanoma-in-situ
- Non-melanoma skin cancer
- Family history of melanoma

Resources

[Skin Cancer \(Including Melanoma\)—Health Professional Version](#)

[Moles to Melanoma](#)

[Common Moles, Dysplastic Nevi, and Risk of Melanoma](#)

[Current Clinical Trials to Prevent Melanoma](#)

[Current Clinical Trials to Treat Melanoma](#)

[Skin Cancer information for non-white patients: Anyone Can Get Skin Cancer](#)

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- Melanoma
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Melanoma Risk Assessment Tool: Information Entry Page

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Demographics

1 Skin Characteristics 2

Demographics

What is the patient's race?

- Non-Hispanic white
- Other

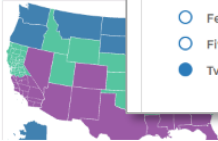
What is the patient's age?

This tool calculates risk for patients between 20 and 70 years of age.

30

Does the patient live in the Northern, Central, or Southern United States?

The model on which this tool is based is valid only for residents of the continental United States. This map is only a guide.



- Northern
- Central
- Southern

What is the patient's gender?

This tool uses gender-specific risk models; different male patients are asked about history of blistering sunburn and evidence of solar damage; female patients are asked about how their skin responds to sun exposure.

- Male
- Female

Skin Characteristics

Is the patient's complexion light, medium, or dark?

- Light
- Medium
- Dark

Ask the patient: After repeated and prolonged exposure to sunlight, at the age you become very brown and deeply tanned, moderately tanned, lightly tanned, or no tan at all

- Very brown and deeply tanned
- Moderately tanned
- Lightly tanned
- No tan at all


Physical Exam

How many moles less than or equal to 5mm in diameter are on the patient's back?

- Fewer than five
- Five to eleven
- Twelve or more


How extensive is the freckling on the patient's back and shoulders?

- Absent




Enlarge

- Mild Freckling



Enlarge

- Moderate Freckling



Enlarge

- Severe Freckling

Calculate Risk

Reset

Melanoma Risk Assessment Tool: Results Page

Personalized Risk of Developing Melanoma Cancer

- Although a patient's risk may be accurately estimated, these predictions do not allow one to say precisely which patient will develop melanoma.
- Some patients who do not develop melanoma have higher risk estimates than those who do develop the disease.
- As a reminder, this tool was designed for use by health professionals. If you are not a health professional, you are encouraged to print these results and discuss them with your provider.
- The tool uses the answers provided to estimate 5-year absolute risk of developing melanoma. This includes the patient's personal medical history, risk factor information, and an examination of the skin on the patient's back and shoulders.
- Patients can reduce their risk for melanoma by engaging in sun-protective behaviors, such as seeking shade, avoiding sun during peak hours (10AM - 2PM), wearing a wide-brimmed hat and covering up exposed skin, and using sunblock with an SPF of 30 or higher.

Patient's 5-Year Absolute Risk of Developing Melanoma

0.4%



Based on the information provided, the patient's estimated risk for developing melanoma over the next 5 years is 0.4%. A risk of 0.4% means that out of 1,000 white women with these characteristics living in the southern region, 4 will be expected to develop melanoma in the next 5 years.

Your Answers

These results are based upon how you answered the following questions:

Questions:

1. What is the patient's race?
2. What is the patient's age?
3. Does the patient live in the Northern, Central, or Southern United States?
4. What is the patient's gender?
5. Is the patient's complexion light, medium, or dark?
6. Ask the patient: After repeated and prolonged exposure to sunlight, at the age you are now, would your skin become very brown and deeply tanned, moderately tanned, lightly tanned, or no tan at all?
7. How many moles less than or equal to 5mm in diameter are on the patient's back?
8. How extensive is the freckling on the patient's back and shoulders?

Answers:

Non-Hispanic white
65
Southern
Female
Medium
Moderately tanned
Twelve or more
Moderate Freckling

Edit Responses

Start A New Assessment

Breast Cancer and Colorectal Cancer Risk Assessment Tools

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Breast Cancer Risk Assessment Tool

RISK CALCULATOR ABOUT THE CALCULATOR

The Breast Cancer Risk Assessment Tool

The Breast Cancer Risk Assessment Tool estimates a woman's personal risk of developing invasive breast cancer in the next 5 years.

The tool uses a woman's personal history, degree relatives (mother, sisters), and developing invasive breast cancer in the next 5 years.

Personalized Risk of Developing Breast Cancer

Based on the information provided, the patient's estimated risk for developing breast cancer over the next 5 years is **1.8%**, compared to the average risk of **1.5%** (presented in blue) for a patient of the same age and race/ethnicity in the general U.S. population.

5-Year Risk of Developing Breast Cancer

Patient Risk: 1.8% | Average Risk: 1.5%

Personalized Risk of Developing Breast Cancer

Based on the information provided, the patient's estimated risk for developing breast cancer over their lifetime is **8%**, compared to the average risk of **6.8%** (presented in blue) for a patient of the same age and race/ethnicity in the general U.S. population.

Lifetime Risk of Developing Breast Cancer

Patient Risk: 8% | Average Risk: 6.8%

Your Answers

These results are based upon how you answered the following questions:

Questions	Answers
1. Does the woman have a confirmed history of any breast cancer or of ductal carcinoma in situ (DCIS) or lobular carcinoma in situ (LCIS) or has she received previous radiation therapy to the chest for treatment of Hodgkin lymphoma?	No
2. Does the woman have a mutation in either the BRCA1 or BRCA2 gene, or a diagnosis of a genetic syndrome that may be associated with elevated risk of breast cancer?	No
3. What is the patient's age?	40
4. What is the patient's race/ethnicity?	Hispanic/Latina
5. Has the woman ever had a breast biopsy?	Yes
6. How many breast biopsies (positive or negative) has the woman had?	1
7. Has the woman ever had a breast biopsy with atypical hyperplasia?	No

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Colorectal Cancer Risk Assessment Tool

RISK CALCULATOR ABOUT THE CALCULATOR

The Colorectal Cancer Risk Assessment Tool

The Colorectal Cancer Risk Assessment Tool estimates the risk for men and women who are:

- Between the ages of 45 and 85
- White
- Black/African American
- Asian American/Pacific Islander
- Hispanic/Latino

This tool takes about 5 minutes to complete.

Personalized Risk of Developing Colorectal Cancer

Based on the information provided, the patient's estimated risk for developing colorectal cancer over the next 5 years is **0.4%**, compared to the average risk of **0.5%** (presented in blue) for a patient of the same age, gender, and race/ethnicity in the general U.S. population.

5-Year Absolute Risk of Developing Colorectal Cancer

Patient Risk: 0.4% | Average Risk: 0.5%

Personalized Risk of Developing Colorectal Cancer

Based on the information provided, the patient's estimated risk for developing colorectal cancer over their lifetime is **3.2%**, compared to the average risk of **3.7%** (presented in blue) for a patient of the same age, gender, and race/ethnicity in the general U.S. population.

Lifetime Risk of Developing Colorectal Cancer

Patient Risk: 3.2% | Average Risk: 3.7%

Your Answers

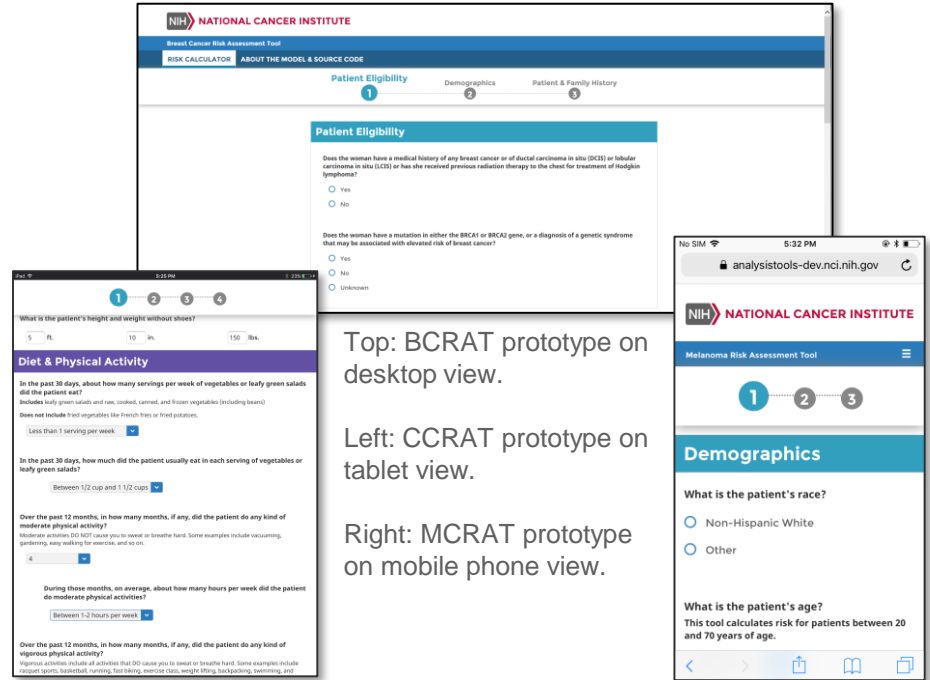
These results are based upon the following information:

Questions	Answers
1. Is the patient Hispanic or Latino?	No
2. To which of the following does the patient identify?	White
3. What is the patient's age?	50
4. What is the patient's sex?	Male
5. What is the patient's height and weight without shoes?	5' 11" and 200 lbs
6. In the last month, about how many servings of vegetables or leafy green salads did the patient eat per week?	3-4 servings/week
7. In the last month, about how many servings of moderate physical activity?	5
8. In the last month, about how many servings of heavy green salads did the patient eat per week?	3-4 servings/week
9. In the last month, about how many servings of leafy green salads did the patient eat per week?	1-2 cups - 3 cups
10. In the last month, about how many servings of leafy green salads did the patient eat per week?	1-2 cups - 3 cups
11. In the last month, about how many servings of leafy green salads did the patient eat per week?	1-2 cups - 3 cups
12. In the last month, about how many servings of leafy green salads did the patient eat per week?	1-2 cups - 3 cups
13. During the past 30 days, did the patient take medications that may increase the risk of colorectal cancer?	No

Method Summary

UX Test Method Summary

- Participants were asked about their healthcare profession and their role in discussing information about cancer or cancer education with patients.
- Participants were shown the three cancer risk assessment tools in random order on either a mobile phone, tablet, or desktop computer.
- Participants were asked to input hypothetical patient scenarios into the tools and then provide feedback about the tools' functionality, clarity, and usefulness.



Top: BCRAT prototype on desktop view.

Left: CCRAT prototype on tablet view.

Right: MCRAT prototype on mobile phone view.

UX Test Method Summary, cont'd

- Following their interaction with the three cancer risk assessment tools, participants completed the System Usability Scale* (SUS) questionnaire to evaluate their perceived usability of the tools.
- Participants were then asked a few debriefing questions to close the interview.

System Usability Scale (SUS) Questionnaire

Please circle the numbers that most appropriately reflect your experience with the website.

* Required

Participant Number *

Your answer _____

I think that I would like to use the Cancer Risk Assessment Tools frequently if patients had questions about their risk of developing cancer: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I found the Cancer Risk Assessment Tools unnecessarily complex: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I thought the Cancer Risk Assessment Tools were easy to use: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I think that I would need the support of a technical person to be able to use the Cancer Risk Assessment Tools: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I found the various functions within each of the Cancer Risk Assessment Tools were well integrated with each other: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I thought there was too much inconsistency in the Cancer Risk Assessment Tools: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I would imagine that most people would learn to use the Cancer Risk Assessment Tools very quickly: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I found the Cancer Risk Assessment Tools very awkward to use: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I felt very confident using the Cancer Risk Assessment Tools: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

I needed to learn a lot of things before I could get going with the Cancer Risk Assessment Tools: *

Strongly Disagree Disagree Neutral Agree Strongly Agree

Pick one choice ○ ○ ○ ○ ○

SUBMIT

Never submit passwords through Google Forms.

System Usability Scale questionnaire.

*Brooke, J. (1986). System Usability Scale (SUS): A quick-and-dirty method of system evaluation. Journal of User Information Architecture Advanced Development Group, DEC, Reading, UK.



Eye Tracking for Observational Purposes

Live Viewer



Benefits

1. Viewing the gaze data live informs observers about eye movement patterns
 - F-shaped reading pattern
 - Noticeability
 - Order of information entry
2. Increases stakeholder observation and participation
3. Increases support and buy-in for the research

Impact

Impact

1. Time to enter information into the tool was much shorter than expected.
2. The pages for the tools were updated iteratively as high impact issues were identified.
3. The questions and text were revised to use more plain language and areas were identified to provide further information and instructions.
4. Participants found it easier to use the tools on a desktop than on a tablet or mobile phone.
5. Changes were made to optimize information input on mobile devices.
6. Participants enjoyed using the tools and viewed them as valuable resources to use both at home and in a clinical setting.



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