

Developing a Web Site in Primary Care

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Background and Objectives: *While content, navigability, and usability are essential qualities of effective Web sites, the health care literature contains limited discussion of these issues. This article describes how knowledge gained through focus groups, Web site searches, and individual interviews were used to develop and improve a health-related Web site.* **Methods:** *We conducted 10 focus groups and searches of existing Web sites in preparation for developing a Web site about colorectal cancer (CRC) screening. We conducted 30 in-depth interviews to assess content, navigation, and usability of a new CRC Web site, using participants recruited from Michigan communities with a low incidence of CRC testing. Targeted participants were 50–70 years of age, had no prior experience with CRC testing, and had variable comfort levels with Internet use.* **Results:** *Existing CRC screening Web sites uniformly use user-directed navigation and have little variation in content. Our study participants stimulated revisions in content, navigation, and usability. Revised content factors included comprehension, utility, and appeal. Navigation changes focused on logical transition between sections. Usability changes included user focus and clarity of graphics/text.* **Conclusions:** *We found focus groups, Web site searches, and individual interviews useful in developing and testing content, navigation, and usability of a CRC screening Web site. These steps provide methodological procedures for developing and revising health-related Web sites.*

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The Internet is an important source of health information.¹⁻³ One authority reported that 52 million American adults use the Internet to get health information.⁴ By 2005, an estimated 88.5 million Americans will research the Internet for health information and health-related products.⁵ Computer-using adults seek Internet services to augment their health care through organization- and clinic-based Web sites.⁶ Previous studies revealed that Web sites focusing on public health education and preventive services help users make decisions, increase their knowledge, and improve their quality of life.^{7,8}

Having cancer-related information, including colorectal cancer (CRC) information, may increase public awareness and contribute to cancer prevention practices. Though CRC is the leading cause of cancer-related death among nonsmoking Americans,⁹ it is highly curable if detected at an early stage,¹⁰ and regular screening can cut the risk of fatal CRC by about

33%.¹¹ Unfortunately, most Americans are not aware that they should be concerned about CRC or which screening method to choose¹² even though much information is available in print and on the Internet.¹³ An effective CRC Web site might improve awareness and prompt action.

In 2001, we received funding to develop a Web site to promote colorectal cancer screening and to determine the Web site effectiveness. The purpose of the two-phase project was to develop and test a Web site with attention to its content, usability, and navigation (Table 1). Content concerns the Web site substance—comprehension, utility, and appeal. Usability looks at functionality—navigation, timing/timeliness, clarity of graphics/text, user focus, and inclusiveness/comprehensiveness. Navigation is an important component of usability and refers to how easily a user can move throughout the Web site.

In designing and testing the Web site, we involved patients in developing and testing.¹⁴⁻¹⁶ Both focus groups and individual interviews were used to assess the usability and content of the CRC Web site.¹⁷

While usability and content quality are essential for effective Web site development,¹⁸⁻²⁰ there is limited discussion of these issues in health care literature.^{19,21-23}

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Table 1

Data Collection Procedures for Health Care Web Site Development and Their Outcomes

<i>Web Site Development Procedures</i>	<i>Purpose</i>	<i>Implication for CRC Web Site Development</i>	<i>Comments</i>
Internet search of CRC Web sites	<ul style="list-style-type: none"> Identify CRC screening information and whether Web site is interactive 	<ul style="list-style-type: none"> No "free" interactive Web sites were found Developed informational content from existing Web sites about screening procedures, eg, preparation, cost, risk, accuracy, and price 	<ul style="list-style-type: none"> Content information is generally consistent Most Web sites are simplistic electronic versions of paper pamphlets Strengths of electronic media not typically utilized
10 focus groups	<ul style="list-style-type: none"> Identify content and features desired by targeted users 	<ul style="list-style-type: none"> Most useful source of information for developing version 1 of the Web site Results were basis for core concepts of Web site, eg, limiting the text, inclusion of graphics that were not too realistic or gory, and being interactive 	<ul style="list-style-type: none"> Difficult to recruit Expensive to conduct Time consuming for analysis
Knowledge and beliefs assessment of participants	<ul style="list-style-type: none"> Assess for knowledge gaps or inaccurate beliefs that could be barriers to getting CRC screening 	<ul style="list-style-type: none"> No meaningful issues were identified that were not already known from the Web site search Participants were given the correct answers at the end of sessions as an educational intervention and benefit for participation 	<ul style="list-style-type: none"> Inclusion of such an instrument for others developing a Web site could similarly be of little use or turn out to be of significant value Was easy to collect the data
Internet usage screening instrument	<ul style="list-style-type: none"> Assess the level of experience of the participant 	<ul style="list-style-type: none"> Distinguished between novice users and users with sufficient experience to focus on the Web site itself rather than the experience of using the Internet 	<ul style="list-style-type: none"> Novice users were more interested in learning how to use the Internet than to gain information about CRC screening or content and usability of the Web site Highly helpful
30 individual interviews	<ul style="list-style-type: none"> Conducted to assess changes needed in the Web site 	<ul style="list-style-type: none"> Most useful source of information for developing version 2 of the Web site Many changes unequivocally needed to be made 	<ul style="list-style-type: none"> After 10 interviews, no additional changes were made until completion of additional 20 interviews Costs of changing the Web site were prohibitive for additional changes
Field notes	<ul style="list-style-type: none"> Collected during focus group and individual interviews 	<ul style="list-style-type: none"> Field notes were collected in "real time" and were accessible for "real time" changes in Web site development Quickly identified major concerns and problems 	<ul style="list-style-type: none"> Most expedient form of data collection for incorporating observations and feedback from participants Risk of researcher bias to topics of his/her interest

CRC—colorectal cancer

This article's objective is to report how, using the focus group and patient interviews, we developed and tested a CRC Web site for primary care patients.

Methods

This study was conducted in two phases. The purpose of Phase 1 was to develop an initial CRC Web site (Version 1). This phase involved conducting 10 focus group interviews that included a self-administered test of knowledge, attitudes, and beliefs about colorectal cancer (KAB-CRC) and searching and analysis of existing CRC Web sites.

The purpose of Phase 2 was to refine the Version 1 Web site built during Phase 1. Phase 2 involved conducting 30 in-depth individual interviews to assess the Web site's usability and content and developing Version 2 and subsequently Version 3 based on this information. We purposefully chose three geographical areas of the state having high rates of advanced CRC to recruit for urban, suburban, and rural representation.^{24,25} The University of Michigan Institutional Research Board approved this research.

Phase 1

Focus Groups

Participants: In 2001, we conducted 10 focus groups with individuals who upon recruitment self-reported their age to be between 50–70 and that they had not been screened for CRC.^{26,27} Following a stratified random sample process, a professional firm (Robinson & Muenster Associates, Inc) used computer-aided telephone interviewing (CATI) to recruit participants from a random set of telephone numbers from the zip/area codes of the target areas.¹⁴ Focus group composition was organized by self-reported race (Caucasian or non-Caucasian) and gender (male or female) (Table 2).

Implementation: We developed an interview guide designed to address: (1) reasons for not being checked for colon cancer, (2) reasons for being checked, (3) fac-

tors that would influence participants to be checked, and (4) awareness of colon cancer screening. A professional same-sex Caucasian interviewer moderated the 2-hour focus group interviews.^{26,27} After addressing the above questions, the interviewer distributed and reviewed a summary sheet featuring information about four tests used to screen for colon cancer (ie, fecal occult testing, flexible sigmoidoscopy, colonoscopy, and air contrast barium enema). After participants made a private decision written on a piece of paper about which test(s) were their most and least favorite, the moderator interviewed the group about their choices. Final questioning addressed insurance coverage and preferred cancer information sources. The moderator took field notes on the major concerns and preferences of the participants.

Analysis: The focus groups were audiotaped and videotaped and then transcribed.^{28,29} An independent researcher conducted data cleaning—the process of checking accuracy of transcription by listening to the audio and comparing it with the transcribed text. While four investigators each read the transcripts, one person took primary responsibility for “real time” analysis. This involved iterative reviewing of field notes and transcripts for critical information to be incorporated into the Web site. Another investigator conducted an in-depth analysis using grounded theory^{30,31} to develop a transtheoretical model of decision making for choosing a CRC screening procedure.

Knowledge, attitudes, and beliefs about CRC instrument: We administered an instrument developed previously for a baseline assessment of participants’ knowledge, attitudes, and beliefs about CRC since previous literature suggests that beliefs about cancer can be a barrier to cancer screening.³² The instrument contained 21 statements about CRC, and participants were asked to respond with agree, disagree, or unsure. Using SPSS, we examined the data for statistical differences between Caucasian and African American participants to see if race-specific tailoring was needed.

Web Site Search

Searching: Concurrent to the focus groups, three investigators independently searched the Internet using Google and Yahoo search engines for English language Web sites targeting the United States. The search terms used were colon, rectum, cancer, prevention, and screening. This search strategy yielded about 150 unique Web sites. Web sites were eliminated from consideration if a reviewer determined that the (1) aim was marketing a practice or service, (2) primary focus was not on early detection or screening, (3) Web site had no identifiable affiliation with an organization, (4) Web site had navigational problems that created significant

Table 2

Demographics of Focus Group and Individual Interview Participants*

	Focus Group Interviews n=93	Individual Interviews n=30
Race		
African American	51%	50%
Caucasian	49%	50%
Marital status		
Married	46%	47%
Single	21%	20%
Divorced/separated	29%	23%
Mean number of children	2.9	2.8
Mean number of grandchildren	4.2	4.0
Self-report of health		
Excellent	21%	20%
Good	57%	60%
Fair	20%	17%
Poor	3%	3%
Mean number of years of education	13.5 years	13.2 years
Frequency of HME		
Yearly	50%	50%
Every 2–3 years	15%	20%
Every 4–10 years	23%	10%
Never in the last 10 years	12%	20%
Household income		
< \$30,000	50%	50%
> \$30,000	50%	50%

* Fifteen individuals participated in both focus groups and individual interviews by design. Demographic information on these individuals is included in both columns.

HME—health maintenance exam

barriers to evaluation, or (5) Web site was not consistently operational.

Analysis and synthesis: There were 65 to 70 remaining Web sites that two investigators reviewed for content, format, navigation, and interaction. The reviewers agreed there was little variation in the Web sites. There was uniform utilization of user-directed navigation, the format was primarily text, and there were no Web sites with inquiries about individual-specific risks without a fee. There was virtually no variation in factual content, and we used this material as the basis for our Web site development.

Phase 2

Individual Interviews

Participants: Thirty people participated (Table 2). Fifteen had participated in the focus groups—we included them as a verification/member-checking procedure.³³⁻³⁵ To gain fresh insights, we recruited 15 new participants using the same procedures and locations described above and elsewhere.¹⁴

Knowledge, attitudes, and beliefs about CRC instrument: As in Phase 1, participants completed this instrument. We administered it prior to their using the CRC Web site. Data were examined for statistical differences between Caucasian and African American participants and overall between participants of Phase 1 and Phase 2.

Internet Usage Screening Instrument: We developed an Internet Usage Screening Instrument to assess each participant's agility with the Internet and to distinguish between novice and experienced users (Appendix). The interviewer read the questions aloud and recorded the participant's responses. Novice or experienced skill level of the user directly influenced the style of interviewing—expert (interviewer) directed or user (participant) directed, respectively.

Interview guide development: We developed a 48-item interview guide (available from authors on request) to address content and usability of each Web site section. Usability-related factors included navigation, timing/timeliness, clarity of graphics/text, user focus, and inclusiveness/comprehensiveness. Content-related factors included comprehension, utility, and appeal.

Interview procedures: While the participants interacted with the Web site, one investigator conducted interviews using one of three approaches. Unstructured interviews were conducted with the most experienced participants who were advised to go through the Web site until they had visited all areas to their satisfaction. This process is referred to as user-directed navigation.³⁶ A structured interview format was used for novices uncomfortable

with the Internet and involved the interviewer going through the Web site page by page and asking participants questions.³⁶ The semi-structured interview allowed the participants to go through the Web site at their own pace as the interviewer asked interview questions from the guide.³⁶ The moderator took field notes on content, usability, and navigation concerns raised by the participants as they interacted with the Web site.

Analysis: We audiotaped and videotaped the interviews. We conducted data transcription and cleaning as with the focus groups.^{28,29} Three investigators met regularly to review in an iterative fashion the questionnaire responses, field notes, and interview findings. Questions developed during these meetings were added to subsequent interviews.

Results

Phase 1

Focus Groups and Web Site Searching. The identified Web sites were used by a professional team of the University of Michigan Medical Center Health Media lab to create Version 1 of the CRC Web site. Most of the factual content was based on existing Web sites, since these had consistent and accurate information. One investigator spent several meetings iteratively discussing the focus group findings with the Web site designers, who incorporated her suggestions into the Version 1 Web site. Version 1 content was structured around the specific requests of focus group participants. Succinct information about CRC and testing procedures was presented in a tabbed and menu format. Individual Web site pages provided details and corresponded to the tabs.

Knowledge, Attitudes, and Beliefs About Colorectal Cancer Survey. There were no clinically important misunderstandings among the participants on this survey, nor significant differences between African American and Caucasian participants in Phase 1 or 2. While the KAB survey information was not used specifically to alter the Web site, had the results been more compelling, we would have incorporated changes.

Phase 2

After the first 10 participants reviewed the Web site (Version 1), we found minor content and major navigation issues needed attention. The programmers redesigned the Web site to address these concerns. A revised version (Version 2) was used for interviews 11–30. Data from the latter informed the final Web site (Version 3). Audiotapes were used only in case of videotape failure.

Content Issues. Content issues (mostly spelling and grammar) identified during the interviews were corrected in Versions 2 and 3 (Tables 3 and 4). Overall, the

participants agreed that content issues were not as critical as navigation and usability issues.

Navigation Issues. All participants experienced navigation difficulties with Version 1 of the Web site (Table 4). On the home page, participants' eyes focused on larger tabs, and they either ignored subheadings or associated them with another tab. In Version 2, large tabs and subheadings had the same colored background when the large tab was clicked. Participants could see and use the subheadings. In Version 1, not all participants followed the tabs successively, and they missed information needed for making a decision about the CRC test they preferred. In Version 2, participants had to view prerequisite aspects of the Web site before they could choose a test.

In Version 1, there was a short introduction to the section "Should I Get Tested?" This page delivered information on myths, facts, and barriers related to CRC screening. Most participants did not open these links. In Version 2, participants were taken immediately to the "Myth Versus Fact" sub-links and readily understood that there was additional information associated with the large tabs (Figure 1).

Usability Issues. We addressed several usability issues (Table 4). In Version 1, a page provided information about four CRC screening tests, but users were drawn only to the digital rectal exam (DRE) section. In Version 2, we moved the DRE description to another section of the Web site, and this focused users on the intended information.

In "Choosing a Test," users first had to choose a particular test or click for assistance in choosing a test, and, second, they needed to use the Test Chooser. The Test Chooser is an interactive QuickTime movie designed to help the participant choose a screening method based on 10 factors. After the user selected three factors, the Chooser evaluated which test would be most appropriate and linked the participant to a QuickTime movie of a doctor explaining the advantages and disadvantages of that test.

In Version 1, participants did not see the "We Can Help You Decide" link to the Test Chooser. In subsequent versions, the option for having the Web site assist the participant choose a test is highlighted with color and the text increased in size and repeated twice on the page (Figure 2).

Once participants were at the Test Chooser page in Version 1, they were not sure how to proceed (Figure 3). If participants skipped immediately to this page, they did not have the necessary knowledge about the screening tests. In Version 2, participants learned information about each factor as they interacted with the Chooser. We added an option to repeat the test as requested by participants.

Table 3

Most Frequently Reported Comments Made to Improve the Content of a Colorectal Cancer Web Site

- The term *colorectal* was confusing.
- The participants had difficulty pronouncing the names of the tests.
- Abbreviations throughout the Web site were confusing for the participants.
- The titles of the tabs were somewhat misleading.
- Additional diagrams and pictures were requested showing cancerous cells, polyps.
- Clarification was needed as to why African Americans are less likely to get diagnosed with colon cancer.
- Additional information about the screening test was requested, specifically the amount of the colon each test covered.
- The "Myths and Facts" section of the Web site was very confusing to the participants.
- Additional information on prevention methods and bodily symptoms was requested.
- Additional statistics were desired on CRC.
- A reference to who produced the Web site and sources that informed it were requested.

Table 4

Content, Navigation, and Usability Changes Made Based on Data Collection During Phases 1 and 2 of a Colorectal Cancer Web Site Development Project

Content	<ul style="list-style-type: none"> • Difficulty in understanding and pronouncing medical terminology and abbreviations • Requests for more pictures, diagrams • Additional information on some screening tests, prevention methods, and CRC symptoms
Navigation	<ul style="list-style-type: none"> • Eliminating intermediate screens • Color coding the related tabs and numbering headings to provide logical and linear transitions
Usability	<ul style="list-style-type: none"> • Rearranging content information between the sections • Using larger font size and color coding for links • Introducing the option to repeat the screening test information

Lessons Learned. Based on our experience, we propose procedures for developing, testing, and revising health-related Web sites (Table 5). Web site revisions can begin as soon as the first interviews are conducted and analyzed and continue throughout testing.¹⁴

Discussion

The focus groups and the Internet searches of existing Web sites were useful for the initial content and development of the CRC Web site and demonstrated the need for interactive capacity. The individual interviews demonstrated that a user-centered approach to a Web site assessment provides valuable first-hand in-

Figure 1

Navigation Improvement: Difficulty in Not Recognizing Links and Steps to Take to Access Links (Initial) Improved by Connecting Tab Directly With Link to “Myths and Facts” (Final)



Figure 2

Usability Improvement: Difficulty Due to Not Opening “We Can Help You Decide” Link (Initial) Improved by Enhanced Size of Link and Duplication of Link (Final)



formation. The lessons learned from individual interviews with the participants included important details regarding the navigation-, usability- and content-related issues.

User-directed navigation assumes that users are the experts in their individual needs and can freely interact with the Web site. In contrast, expert-directed navigation involves an expert evaluating the needs of the user and giving directions about how to use the Web site. A

hybrid of these two extremes is linear navigation, and it involves forcing the user to visit certain parts of the Web site before going elsewhere. Unstructured interviews during user-directed navigation for experienced users and semi-structured interviews during expert-directed navigation for inexperienced users worked well in this project. Taking over complete control of the Web site exposure alienated most users, and we quickly abandoned this option.

Figure 3

Usability Improvement: Difficulty on the “Choosing a Test” Page Due to Confusion About How to Proceed and Lack of Knowledge About Screening Tests (Initial) Improved by Automatic Linking of the Relevant Information When Selected on the “Choosing a Test” Page (Final)

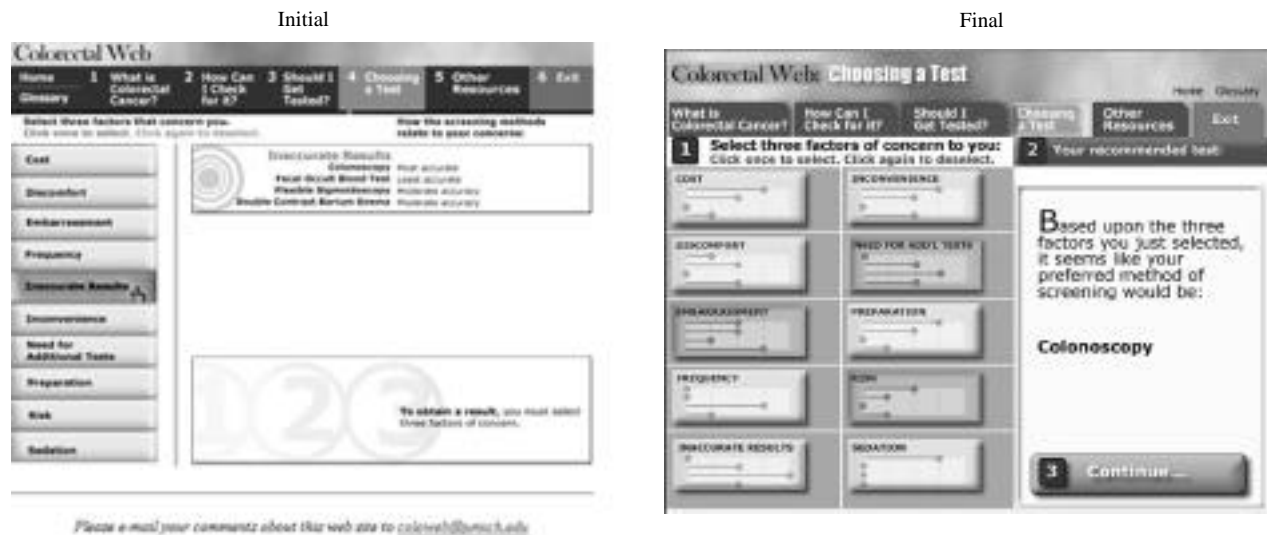


Table 5

Recommended Procedures for Developing and Testing a Web Site in Primary Care

- Take advantage of existing professionally developed Web sites as a starting point or as links from within your own Web site as a compromise to building the entire Web site from the ground up.
- Conduct focus groups and observations to obtain firsthand information on the health care topic of interest. Screen the participants for age, gender, ethnicity, and prior experiences with this topic.
- Transcribe and analyze the focus group and observation data for critical information to be incorporated into the new Web site.
- Conduct individual in-depth interviews and observations of the participants as they use the Web site to collect the data, since these sources provide rich and ample information.
- Purposefully select participants, screening them for age, gender, ethnicity, prior experiences with relevant health care topic, and different comfort level with the Internet.
- Identify the Web site factors that fall under the navigation-, usability-, and content-related issues. Look for these types of issues during interviewing and observing.
- Develop the interview guide to be adaptable to the level of user experience with the Internet. Regardless of the format of the interview, look for recurrent themes from the participants.
- Audiotape and videotape the interviews with emphasis on videotaping the computer screens as participants page their way through the Web site.
- Consider multiple revisions of the Web site based on participant feedback.
- Use at least a two-stage Web site revision process: make changes in the navigation- and usability-related factors after a subset of the interviews are conducted and analyzed and then use the revised version for further testing.

A limitation of Web site development is cost. The cost of developing the Web site over 18 months was \$200,000. Web site development requires an assessment of resources available, and development of strategies needs to be tailored on a case-by-case basis.

Many questions about effective Web site development remain (Table 6). The future may provide patients with “smart” Internet access to their physician. A Web site could link to medical records and determine pre-

Table 6

Research Questions About Effectiveness of Interactive Health Web Sites

- What are the roles of Web logs? (We did not find them useful since they only provide data on areas visited, length of time in area, and paths taken. The researcher is not able to probe the user’s thoughts and rationale behind their actions.)
- Does use of electronic health information sources make a difference in motivating the user to make a decision to seek testing compared to other strategies, eg, public service announcements, mailed brochures, office brochures, etc?
- What are the best mechanisms to reach the target audience?
- How do specific Web site features influence the users’ decision making in finding desired health-related information, in selecting appropriate medical procedures, and in making reasonable choices?
- How could “smart Internet” access improve availability of information on eligibility for CRC and other preventive services?
- What would be the acceptability of “smart Internet” functions to users?

ventive services needed, send patients a reminder to be screened regardless of the reason for contact, and connect with resources to help users make informed decisions. While the most effective/efficient mechanisms for health-related Web site development are not proven, we hope the procedures listed here provide a rational starting place.

Editor's note: The authors of this article have made the Web site developed for this project available for review and comments at <http://healthmedia.umich.edu/projects/coloruffin.htm>.

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Appendix

Internet Usage Screening Instrument

1. Where do you use a computer? (prompt for multiple answers) Anywhere else?
 Home Office Library Other Never (skip to Q9)
2. Can you connect to the Internet at home?
 Yes No (skip to Q4) Don't know (skip to Q4)
3. How do you connect to the Internet at home? (read answers and prompt)
 Telephone modem DSL Cable T-1 Don't know
4. How many hours per week would you say you use the Internet? _____ hours/week
 (if "0" skip to Q9)
5. Have you ever looked for health information on the Internet?
 Yes No , why not? _____ (skip to Q9)
6. Have you ever looked for cancer information on the Internet?
 Yes No , why not? _____ (skip to Q9)
7. Which Web sites about cancer did you find useful?
8. Have you ever looked specifically for information about colon and rectal cancer?
 Yes, which Web sites were most useful _____ No Don't Know
9. Would you be willing to use a new Web site about colon and rectal cancer?
 Yes No Don't know

Thank participant and begin colorectal Web site interview.

Notes on interpretation of Internet Usage Screening Instrument

1. Novice users typically reported:
 - Internet usage only at the library (Question #1) or
 - Internet usage (< 4 hours/week (Question #4)
2. Experienced users typically reported:
 - Internet usage (≥ 4 hours/week (Question #4)
 - Note: virtually all home or office users (Question #1) reported using the Internet ≥ 4 hours/week.
3. The above distinction between novice and experienced users was used as a starting point for deciding on an interview format. There was no precise scoring system because no single criterion or combination of criteria was/were sufficient for clearly distinguishing between novice and experienced users. If the interviewee experienced difficulty using the Internet as the interview proceeded (regardless of the responses to the instrument), the interviewer switched to a more structured interview format immediately. The more novice the user, based on real-time observation during the interview, the greater the need for a more-structured interview. See the Discussion in the text regarding use of structured, semi-structured, and unstructured interview formats.