

Teaching Brief Interventions for Smoking Cessation via an Interactive Computer-based Tutorial

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Abstract

Many current smokers do not plan on quitting any time soon. For these smokers, the immediate treatment goal is not a quit attempt, but an increase in readiness to stop smoking. In the present study we developed an interactive multimedia simulation and tutoring environment that teaches healthcare professionals to provide brief motivational interviewing-based smoking cessation interventions tailored to the patient's current readiness to change. This tutorial utilizes a cognitive science-derived learning approach that provides tailored feedback and lessons based on learners' pre-existing knowledge, is highly interactive and allows learners to practice skills in simulated clinical situations. Results from two pilot studies indicate that healthcare professionals and students found the software easy and enjoyable to use and successfully learned MI-based strategies for smoking cessation.

Keywords

e-learning, motivational interviewing, smoking cessation

Introduction

SMOKING is the leading preventable cause of illness and death in the United States and is responsible for more than 430,000 smoking-related deaths each year (Centers for Disease Control and Prevention, 1998). It is a known cause of cancer, heart disease, stroke and chronic obstructive pulmonary disease and half of all regular smokers die from smoking-related illness. Furthermore, smoking costs the United States more than \$100 billion each year in healthcare and lost productivity costs (CDC, 2001). In spite of the known adverse effects of smoking, an estimated 25 percent of adult Americans smoke as well as nearly 35 percent of high school students (CDC, 2001). Reducing the prevalence of smoking to 15 percent was one of the national health objectives for the year 2000 (CDC, 1995)—an objective we have fallen far short of fulfilling.

The Agency on Health Care Policy and Research (AHCPR) and the Centers for Disease Control (CDC) guidelines for healthcare providers recommend that all clinicians assess smoking status for every patient and then perform brief cessation interventions (Fiore, Bailey, Cohen, Dorfman, Goldstein, Gritz, Heyman, Holbrook, Jaen, Kottke, Lando, Mecklenburg, Mullen, Nett, Robinson, Stitzer, Tommasello, Vellejo, & Wewers, 1996). Approximately 70 percent of smokers visit a physician during any given year, and 90 percent over five years (Ockene, 1987); and an equal percentage visit dentists (Garvey, 1997). Clinicians are therefore in a strong position to improve public health by assisting patients with smoking cessation. For example, the NCI predicts that if 100,000 clinicians were to help 10 percent of their smoking patients to stop each year, this would result in 2 million fewer smokers (Guideline 18; Fiore, Pierce, Remington et al., 1996). Research has shown that very brief physicians' interventions can achieve a quit rate of about 10 percent (Fiore et al., 1996; Russell, Wilson, Taylor, & Baker, 1979).

The AHCPR guidelines recommend that all healthcare providers 'strongly, consistently, and repeatedly' intervene with their patients who use tobacco (Fiore et al., 1996). However, recent studies indicate that few patients receive smoking cessation interventions from their

physicians (Ewing, Selassie, Lopez, & McCutcheon, 1999) or other healthcare providers (e.g. Chambers & Corbin, 1996; Martin, Bouquot, Wingo, & Heath, 1996). One barrier to provider intervention may be a lack of specific training. For example, Wewers, Ahi-jevych and Sarna (1998) contend that although nurses are in a position to effectively intervene, many lack knowledge about how to identify smokers, how to identify efficacious treatments and how to deliver appropriate interventions.

A number of researchers have identified the need for smoking cessation training designed for healthcare providers in primary care settings (e.g. Elder, Ayala, & Harris, 1999; Emmons & Rollnick, 2001; Gregorio, 1994; Humair & Ward, 1998; Prochaska, Koziol-McLain, Tomlinson, & Lowenstein, 1995; Secker-Walker, Solomon, Flynn, & Dana, 1994) and clinicians who have received smoking cessation training are more likely to feel that they have the necessary intervention skills and are more likely to actually intervene (e.g. Prochaska et al., 1995). Thus, offering brief and effective ways to train healthcare professionals to intervene with their patients who smoke should also be a priority. Primary care providers not only need to be encouraged to intervene but also trained in how to intervene with their patients who use tobacco.

Thus, primary care providers need to be trained to deliver brief, empirically supported interventions. In order for the interventions to be effective despite their brevity, they should be tailored to the patient's specific needs and current level of motivation to quit using tobacco. Furthermore, the trainings themselves should be delivered in a way that optimizes clinician's ability to learn the material and therefore ultimately apply it.

Tutorial content

Most smoking patients seen in primary care settings are not planning to quit any time soon (e.g. Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995). For patients who are not ready to quit, focusing on immediate cessation and treatment options will not be helpful and may, in fact, decrease patients' willingness to discuss their tobacco use with their provider. Instead, an increasing body of research suggests that smokers who are unready to make an

immediate quit attempt benefit most from brief interventions that focus on moving them closer to being ready to quit and increases the likelihood of smoking cessation in the long run (Prochaska, DiClemente, & Norcross, 1992).

Motivational interviewing is an empirically based approach to behavior change that is specifically designed to be used with patients at various stages of readiness to change problem behavior (Rollnick, Mason, & Butler, 1999). Motivational interviewing (MI) is based on Prochaska and DiClemente's Transtheoretical or Stages of Change (SOC) model (DiClemente & Prochaska, 1985; DiClemente, Prochaska, Fairhurst, Velicer, Velasquez, & Rossi, 1991; Prochaska, 1979; Prochaska & DiClemente, 1983). The SOC model is widely used and taught by the healthcare community (Ramelson, Friedman, & Ockene, 1999; Velicer, Prochaska, Fava, Laforge, & Rossi, 1999) and identifies stages of readiness to make lifestyle changes such as smoking cessation. These stages of change include precontemplation (not thinking about change), contemplation (starting to consider change, but not starting to act), preparation (ready to change the behavior and getting ready to act), action (making initial steps toward behavior change) and maintenance (maintaining behavior change; DiClemente et al., 1991).

Although the SOC model is taught in most healthcare training programs, interventions based on the model are not yet common practice. Healthcare providers typically offer smoking cessation interventions that are most appropriate for patients who are ready to make a quit attempt (e.g. nicotine replacement therapies). Patients who are in the precontemplation stage need brief interventions that focus on moving them to the next stage of change. Motivational interviewing is a counseling approach that targets brief intervention strategies to a patient's current stage of change, thus promoting movement through the stages of change (Miller & Rollnick, 1991; Rollnick et al., 1999).

Movement toward greater readiness to change can have considerable impact on the likelihood that patients will quit smoking on their own. Prochaska et al. (1992) report that programs that help patients progress one stage toward readiness to change in month one of a six-month period, can double the chance that they will take action to quit smoking by month

six. This suggests that movement toward greater readiness to change, particularly for the majority of smokers, who are precontemplative, is an important clinical objective. Most smokers require three to four action attempts before they succeed in long-term maintenance, and unsuccessful action attempts often result in a spiral back to an earlier stage of change (Perz, DiClemente, & Carbonari, 1996). MI responds to the dynamic nature of patients' change processes, matching treatment with stage of readiness to change. MI is a directive client-centered approach to helping patients change behavior (Miller & Rollnick, 1991; Rollnick et al., 1999) with a set of core principles including: (1) expressing empathy by using reflective listening; (2) developing discrepancies between client goals and values and current behavior by use of reflective listening and objective feedback; (3) avoiding argumentation by assuming that the client is ultimately responsible for their decision to change; (4) 'rolling with' resistance, rather than confronting it; and (5) supporting self-efficacy and optimism regarding change (e.g. Emmons & Rollnick, 2001).

Motivational interventions have been shown to increase smoking cessation rates in primary care settings. For example, Manfredi, Gritteneden, Warnecke, Engler, Cho and Shaligram (1999) found that a multi-component motivational intervention that included self-help materials, brief provider interventions and a phone call from an MI-trained counselor doubled the quit rates for women in public health clinics. Furthermore, preliminary data suggest that motivational interviewing can be taught effectively to primary healthcare providers with favorable results (e.g. Rollnick, Butler, & Stott, 1997), including smoking cessation interventions (e.g. Rollnick, Heather, & Bell, 1992). Other studies have reported that a variety of allied health providers are open and responsive to training in MI techniques (Arthur, 1999; Cassidy, 1999; Handmaker, Hester, & Delaney, 1999; Stott, Rees, Rollnick, Pill, & Hackett, 1996).

Educational approach

As cited above, empirical research supports the idea that MI approaches can provide a good foundation for developing brief smoking

cessation interventions. The ultimate goal, however, is to get healthcare providers to actually try MI strategies with tobacco-using patients. The conceptualization and design of an interactive Web-based tutorial must address the need to teach the material in a way that optimizes opportunities for learning.

Making learning of the material interactive, tailoring information to a learner's knowledge base, providing feedback and including opportunities to apply and practice new knowledge or skills are all approaches that can enhance learning effectiveness (Di Sessa & Minstrell, 1998; Kreuter, Farrell, Olevitch, & Brennan, 2000). Pioneering research in cognitive science led to the development of an approach called Facet-based Learning (FBL) by Di Sessa, Hunt, Minstrell, van Zee and others over the past decade (e.g. Di Sessa, 1993; Di Sessa & Minstrell, 1998; Hunt & Minstrell, 1994; van Zee & Minstrell, 1997). The FBL approach characterizes student thinking in terms of facets or 'pieces of information or skills from which students construct explanations to solve problems'. Thus, in a Facet-based Learning approach, an instructor first determines what a learner knows about a specific topic and then constructs a brief lesson with feedback designed to modify the learner's understanding. Consistent with other models of learning (e.g. Bruer, 1993; Glaser, 1988), FBL theory states that instruction is more effective when it builds on a learner's pre-existing conception rather than simply providing the learner with a set of facts. The technique has been successfully applied and validated in the classroom teaching of physics and statistics (Hunt & Minstrell, 1994; Madigan, Clarkson, Donell, Hunt, Keim, & Minstrell, 1997).

In the MIRIS tutorial the FBL approach was applied by gathering a list of common responses to clinical smoking cessation scenarios. This was done by asking over 100 healthcare students and professionals how they would respond to the various clinical scenarios used in the tutorial. These responses became the basis for the multiple-choice pages that guide the tailored-feedback pages. Thus, the learner reads a clinical scenario and then responds to the scenario. Then the learner is asked to match his or her own response to a list of common responses that have been derived from the facet-gathering research. The list also includes a best

practice response. If the learner chooses one of the non-best practice answers, he or she is delivered a tailored feedback message that teaches the best practice response by first explaining why the answer chosen by the learner is not best practice. The FBL approach to learning is consistent with the principals of tailoring messages for effective learning and behavior change (Kreuter et al., 2000).

The present study

The goals of the present project were to: (1) develop a multimedia instructional tutorial to teach MI-based brief intervention strategies for precontemplative smokers deliverable over the Internet and incorporating an empirically based learning system (FBL); and (2) conduct a preliminary evaluation of the usability of the software and the effectiveness of the system as a training tool. In order to achieve these goals, we conducted two studies. The first was a preliminary evaluation of the effectiveness of the first two modules of the software for teaching basic MI strategies and principles. Data collected in this study were used to revise the software. The second study was a randomized trial of the tutorial's ability to teach MI-based brief intervention skills and MI principles. A comparison control group was included (reading national guidelines for smoking cessation). A usability trial was also conducted with the participants in Study 2 who used the smoking cessation training software.

Study 1

Method

The tutorial: Motivational Interviewing via Role-play Internet Simulation (MIRIS) MIRIS was designed to teach healthcare providers strategies for conducting a brief smoking cessation consult using an MI-based approach adapted for healthcare settings by Rollnick et al. (1999). The pilot version of MIRIS used in the present study consisted of four modules: Beginning the Consult, Assessment, Intervention and Ending the Consult. The full version of MIRIS will include modules teaching MI-based brief intervention strategies for patients contemplating quitting as well as those in the action and maintenance stages of change. MIRIS teaches

the key aspects of MI through a cognitive science-based learning approach (Facet-based Learning or FBL; Di Sessa, 1993). As described above, FBL assesses a learner's pre-existing knowledge and then gives the tutorial user individualized feedback.

Healthcare professionals who use MIRIS learn to:

1. create a therapeutic environment that facilitates change, guided by the philosophy of motivational interviewing (Miller & Rollnick, 1991, p. 33);
2. broach the topic of tobacco use in the context of a primary care visit;
3. assess tobacco use (e.g. quantity, frequency, previous quit attempts), quitting readiness and the patient's ratings of importance of quitting and confidence regarding successful cessation;
4. choose among several brief motivational enhancement strategies (e.g. discussing the pros and cons of smoking/quitting, discussing barriers to quitting) depending on the results of the aforementioned assessment;
5. respond to patient ambivalence and resistance as normal and expected by employing strategies to 'roll with' rather than confront resistance;
6. end a smoking cessation discussion by eliciting positive patient statements regarding change, helping patients to set small and attainable goals (which may be as small as 'think more about the costs of smoking') and to always arrange for follow-up.

Assessment and instructional strategies of the tutorial As discussed above, MIRIS teaches MI skills by setting up clinical scenarios and asking learners about their knowledge or beliefs about the scenario. Learners make decisions and take actions based on their own skill and knowledge sets. On the basis of these actions, MIRIS provides tailored feedback and instruction.

In the FBL-based approach used in MIRIS, learners respond to a simulated patient or clinical scenario by typing free-format text answers. After learners are satisfied with their response, they are shown a list of common, prototype answers and are asked to match their response to one of them. This free-format

response method allows the learner to recall the most adaptive response without relying on the cues that are given by the answers supplied in the multiple-choice approach. Based on the matched response, the tutorial provides prescriptive feedback and instruction.

MIRIS also utilizes a user interface that is attractive and engaging. The graphics that are integrated into each page are not chosen merely to add to the attractiveness of the tutorial, but also are critical parts of each lesson, showing potential patient responses to different provider interventions. Fig. 1 shows examples of MIRIS feedback pages. An explanatory demonstration of MIRIS is available at <http://www.talariainc.com/miris.html>

Participants Participants for Study 1 were a convenience sample of 25 nursing and pre-nursing students. Although we did not collect demographic information for this group, these students were drawn from a nursing school in a university with the following ethnic minority breakdown: Native American, 1 percent; Asian, 23 percent; African American, 3 percent; Hispanic, 4 percent.

Measures Participants answered the question: 'How would you, as a healthcare professional, motivate smokers to quit?' They answered the question before and after using the MIRIS tutorial. After using the tutorial, they also answered the question: 'What do you think about this approach to smoking cessation?'

Procedure Participants answered the question above in essay format both before and after using two modules of the MIRIS tutorial (Beginning the Consult and Assessment) for 30 minutes.

Results

Pre-test Before seeing the MIRIS tutorial, the most common strategies that the participants said that they would use to motivate patients to quit smoking were: (1) telling the patients about the health dangers of smoking (71%); and (2) using 'scare tactics' (showing pictures of damaged lungs, etc., 53%). They also stated that they would recommend treatment approaches such as nicotine replacement therapies (35%), talk about the effects of smoking on others in the



Figure 1. Examples of feedback pages from the MIRIS tutorial.

smoker's life (25%) and talk about the other costs of smoking (20%). Ten percent of the sample stated that they would 'just tell the person to stop smoking'.

Post-test After using the MIRIS tutorial, participants cited specific techniques taught in the tutorial: (1) assessing readiness to quit, importance and confidence in quitting (65%); (2) asking for patient's permission to broach the topic (35%); and (3) helping patients set small and attainable goals (35%). Participants also showed evidence of learning general MI principles. For example, participants stated that they would: (1) respect the patient (35%); (2) talk to the patient about his or her thoughts and feelings about smoking (12%); (3) summarize what the patient said (18%); and (4) tailor the intervention to the patient (18%).

Opinions about the MI approach Seventy-five percent of the participants stated that they would prefer an MI approach to another approach if they were patients.

Summary Twenty-five nursing and pre-nursing students learned basic MI principles and techniques specifically tailored to help motivate patients unready to quit smoking by using two modules of MIRIS for 30 minutes. Most (75%) of the participants stated that they would prefer this approach if they were patients.

Study 2

Method

Study 2 was both a randomized trial of the effectiveness of MIRIS for teaching MI-based brief intervention strategies for smoking cessation and a usability trial for the software. The purpose of the study was to determine if healthcare professionals and students could learn brief MI-based strategies from using the pilot version of MIRIS. See Study 1 above for description of the MIRIS tutorial.

Participants Participants in Study 2 were 28 healthcare providers recruited from local training programs and hospitals. Participants were recruited via flyers and e-mail announcements. Thirty percent of the sample were nurses or nursing students, 48 percent were counselors,

psychologists or other mental health providers, 21 percent were dental students, medical students or residents. With regard to gender and ethnicity, 30 percent were male and 21 percent belonged to an ethnic minority group (minorities represented included Native American, Asian and multi-racial). Participant age ranged from 24 to 66 years ($M = 34.6$; $SD = 11.8$). Although 12 of the participants (43%) were students, all of them had clinical experience ($M = 5.7$ years, $SD = 5.5$ years) and 25 percent had experience helping patients quit smoking. All the participants reported being 'comfortable' or 'very comfortable' using a computer. Participants were excluded from the study if they reported training or expertise in motivational interviewing.

Measures

1. Usability. Usability testing is a common way of evaluating the ease of use, attractiveness and perceived usefulness of new software (Dumas & Redish, 1999). To evaluate the usability of the MIRIS software, we administered a written evaluation form that used both five-point Likert-scale and open-ended questions. This form is a version of our standard software usability measure and has been used in several other in-house trials. The form includes questions regarding the ease of use of the software as well as the participant's opinion of the software (see Table 1 for questions).
2. Teaching effectiveness. Two teaching effectiveness measures were administered. Both measures were written for the present study and were in the style of measures given before and after motivational interviewing training seminars. Both of these measures were based on MI theory and principles as outlined in the two seminal MI texts, Miller and Rollnick (1991) and Rollnick et al. (1999) and were evaluated by MI-training expert consultants. The first questionnaire was an open-ended form giving clinical scenarios and situations common to a smoking cessation consult in a primary care setting. The participants were asked to write down what they would have said in the clinical situation and why. This measure was given before and after the intervention and served two

purposes. The first purpose was to assess for previous motivational interviewing training/experience. The second purpose of the open-ended measure was to evaluate learning that occurred during use of the MIRIS tutorial or the control materials. A coding system for this measure was developed for this study by the research team. The coding system was based on MI principles derived from Miller and Rollnick (1991) and Rollnick et al. (1999). One of the researchers, an MI expert who was blinded to the participants' condition, coded the questionnaires. See Appendix for examples of questions.

The second teaching effectiveness questionnaire was a multiple-choice measure also written for the present study. This measure consisted of 15 multiple-choice items with four answer choices and included questions specifically related to smoking cessation in a primary care setting. These questions were based on MI-based brief intervention techniques as taught in Rollnick et al. (1999). See Appendix for examples of questions.

Procedure Participants filled out pre-test questionnaires (demographics form and pre-test of smoking cessation skills). They were randomly assigned to either the MIRIS group or the control materials group and spent at least 45 minutes using the tutorial or reading the control materials (participants were allowed to spend more time if needed to complete the learning part of the study).

Intervention and control conditions Participants were randomly assigned to use the MIRIS tutorial ($N = 18$) or to read *Treating tobacco use and dependence: A clinicians' quick reference guide* on the Internet ($N = 10$) (Fiore et al., 1996, <http://www.surgeongeneral.gov/tobacco/tobaqrg.htm>). The *Quick reference guide* for Clinicians contains strategies and recommendations from the Public Health Service-sponsored Clinical practice guideline, *Treating tobacco use and dependence*, and outlines guidelines for brief interventions for patients who are both willing and unwilling to quit using tobacco. The guidelines cover material similar in topic area to MIRIS. This website was chosen for the control condition for

several reasons. First, it contains the recommended smoking cessation guidelines for the healthcare industry and as such is a legitimate educational alternative. Second, it is available via the Internet, so the modality was the same for both conditions (i.e. reading text on a computer screen). Third, the guidelines cover content similar to and overlapping with the MIRIS tutorial (e.g. both instructed providers to assess roadblocks or barriers to quitting), although the guidelines do not teach providers how to provide these interventions. Participants in the control materials condition were instructed to spend at least 45 minutes reading over and studying the guidelines. They were asked to concentrate on the section aimed at patients unwilling to quit, since that is the area covered by the MIRIS tutorial.

MIRIS condition participants were instructed to go through the entire MIRIS tutorial (four modules: Beginning the Consult, Assessment, Intervention and Ending the Consult). Most participants finished the tutorial in about 45 minutes; several spent longer (e.g. one person spent 1.5 hours).

Results

Usability Usability testing is a common way of assessing the acceptability and usefulness of new software. We asked the participants in the MIRIS condition to rate the software with regard to its technical performance, ease of use, visual appeal, and usefulness as an educational tool. Overall participants found MIRIS very easy and enjoyable to use and thought it an excellent alternative to traditional learning methods. See Table 1 for a summary of the results.

Teaching effectiveness To evaluate the differences between the group means on the multiple-choice post-test questionnaire we conducted a two-tailed independent samples *t* test. Results showed that the MIRIS group had significantly higher scores than the control group (MIRIS $M = 14.11$, $SD = 1.08$; Control $M = 9.90$, $SD = 1.52$; $t(26) = 8.54$, $p < .000$). The effect size was 2.5, indicating that the MIRIS group scored, on average, 2.5 standard deviations above the control group on this measure.

Participants also completed a measure consisting of open-ended clinical scenarios. We

Table 1. Results of usability evaluation

Question	<i>M (SD)</i>
1. I found the software easy to use	4.6 (0.50)
2. The situations and conversations presented were realistic enough to teach the material	4.3 (0.73)
3. I enjoyed using the software	4.3 (0.66)
4. I found the software attractive to look at	4.1 (0.44)
5. A version of this software would be a good teaching tool for students	4.5 (0.61)
6. A version of this software would be a good teaching tool for professionals	4.5 (0.61)
7. I enjoyed using the software more than I would have enjoyed reading the material from a book	4.5 (0.95)
8. I'll be able to use some of the techniques presented in the tutorial in my clinical work	4.5 (0.76)
9. My overall impression of the software is (1 = very unfavorable; 5 = very favorable)	4.32 (.57)

Note: Each question was answered on a Likert-scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree)

developed a coding scheme to code each response on a five-point scale: 5 indicated a best practice MI response and 1 indicated a response antithetical to motivational interviewing practice (e.g. likely to elicit resistance from the patient). This coding system was based on two motivational interviewing texts (Miller & Rollnick, 1991; Rollnick et al., 1999). The questionnaires were coded by the second author, an expert MI therapist. We conducted a two-tailed independent samples *t* test to examine the group differences on the post-test. Results indicated that MIRIS participants scored higher on this measure than control participants (MIRIS $M = 45.07$, $SD = 4.46$; Control $M = 25.00$, $SD = .70$, $t(20) = 1.96$, $p < .000$). Thus, there is preliminary evidence that MIRIS does teach MI-based skills and techniques for smoking cessation.

A qualitative analysis of the MIRIS group post-tests indicated that MIRIS users showed evidence of using at least three key MI learning objectives. First, post-MIRIS participants responded that they would ask patients about their readiness to quit as part of their assessment. This reflects the acceptance of the basic MI principle that degree of readiness affects patient and provider behavior. Second, MIRIS users were more likely than control participants to assess a patient's readiness to quit before starting in with information and advice, which was the most common strategy mentioned by all participants at pre-test (and controls at post-test). Finally, post-MIRIS participants responded to patient statements in ways that conveyed more empathy and were less likely to engender patient resistance (as defined by Miller & Rollnick, 1991; Rollnick et al., 1999). Specifically, participants in the MIRIS condition

acknowledged, normalized or explored patient ambivalence more often than those in the control condition—who were more likely to ignore ambivalence and focus on providing convincing information. These strategies are at the heart of motivational interviewing and are not intuitive to those not trained in brief motivational counseling techniques.

Summary of Study 2 Twenty-eight health-care professionals and students were randomly assigned to use MIRIS or read the national guidelines for smoking cessation. Usability results indicate that participants who used MIRIS rated the tutorial highly on ease of use, attractiveness, and functionality as a teaching tool. They also reported enjoying using the tutorial. Results indicate that participants who used MIRIS had higher scores on post-test measures of smoking cessation skills and techniques and learned MI principles.

Discussion

The present study included two preliminary evaluations of pilot version of an interactive Web-based training tutorial to teach MI-based brief tailored intervention techniques for smoking cessation to healthcare providers. The teaching method of the tutorial is based on an empirically validated learning approach (FBL), which gives tailored feedback to learners based on their existing ideas. The tutorial is highly interactive, requiring learners to practice their skills in simulated clinical situations, engaging and attractive.

Results from an essay-format pre-post-questionnaire given to nursing students who used two

of the MIRIS modules, indicated that the students learned specific MI strategies for motivating patients to become more ready to quit (e.g. assessing readiness to change, asking permission to start discussion) and learned some of the basic principles of MI (e.g. to take a patient-centered approach, to summarize patient statements). Results from the second study, a randomized trial of the teaching effectiveness of MIRIS versus the national smoking cessation guidelines, show that participants who used the tutorial learned more about motivating patients who were unready to quit smoking than the control group. Participants who used MIRIS also rated it as highly useful as an educational tool.

These studies were preliminary pilot studies of MIRIS' usefulness as a clinical training tool. As pilot studies, the primary goal was to gather evidence from which to base continued development of MIRIS as well as continued investigation of MIRIS' impact on healthcare provider behavior. One limitation of these studies was a lack of available standardized measures with established reliability and validity. We used measures specifically written for this study. We wrote these measures to try to replicate difficult clinical situations common to healthcare providers attempting to motivate their patients to quit smoking. As such, two of the measures were open-ended, which required the development of a coding system. As this was a pilot study, we did not train multiple coders and assess their inter-rater reliability. Further research will require refinement of the coding system as well as training of multiple coders and the establishment of inter-rater reliability.

As these were pilot studies, we were not in a position to evaluate the effectiveness of the tutorial to change provider behavior in actual clinical settings. In order to truly assess the effectiveness of this tutorial, we would need to observe providers conducting smoking cessation consults and evaluate their use of MI techniques.

Despite their limitations, these studies do provide preliminary evidence that Internet-delivered training can effectively teach clinical skills. In the second study, a review of participants' responses to the clinical scenarios suggested that the tutorial was successful in conveying key MI learning objectives that are not particularly intuitive for those untrained in these brief strategies.

Results of the present studies support the idea that healthcare professionals can learn clinical skills from computer-based training software. With a minimum of time invested (about 45 minutes) healthcare students and professionals learned basic skills for helping precontemplative smokers move toward change. Computer-based training has several advantages over traditional learning approaches. First, learning occurs at the learners' convenience. Internet-delivered tutorials are available at the time and place that best suits the learner. Second, the interactive features of this software allow learners to get specific feedback based on their performance as well as practice new skills in simulated clinical situations. Third, the learner sets the pace of learning. Self-directed learning allows learners to spend more time with concepts and skills particularly difficult for them. Finally, attractive and interactive software engages learners and keeps their interest. Participants who used MIRIS gave overwhelmingly positive feedback including comments such as 'simple and straightforward, it made learning easy', 'challenging and engaging' and 'interesting, easy to use, and informative'.

Appendix

Sample questions from Study 2 questionnaires

Sample questions from the multiple-choice post-test

1. What would you say if your patient said, 'I know smoking is bad for me, but the last time I quit it only lasted three days and it was a waste of time and energy.'
 - A. 'I know quitting is hard, but if you follow our advice and join the smoking cessation support group, I think you can do it.'
 - B. 'What would you say are the pros and cons of smoking?'
 - C. 'What went wrong last time and what do you think would stand in your way if you decided to try again?'
 - D. 'I would like to see you quit in the next month or so. Do you think that's a reasonable goal?'
2. After you assess for quantity and frequency of smoking and any previous quit attempts, what would you do next?

- A. Offer a menu of smoking cessation options.
- B. Ask about the pros and cons of smoking.
- C. Ask about barriers to change.
- D. Ask about readiness to quit.

Sample questions from the open-ended clinical scenarios questionnaire

Imagine that you are seeing a patient for a brief smoking cessation consult. Based on what you've learned today, write down how you would respond to the following patient statements or situations and briefly state why (e.g. what's your main point or objective in saying that).

- 1. 'I don't want to talk about smoking.'
- 2. 'I'm just not ready to quit yet.'
- 3. 'I've tried to quit a million times. It's no use.'
- 4. 'I'm not interested in another lecture about smoking.'

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